Railway Engineering and Maintenance

The Answer—Dependable Rail Anti-Creepers

When rail joints were expected to resist the tendency of rails to creep, the spacing of joint and adjacent ties was an annual expense.

The use of dependable Rail Anti-Creepers eliminates this expense and makes it possible to maintain better line and surface.

NEW YORK PARIS MONTREAL

THE P. & M. CO.

LONDON CALCUTTA SYDNEY

CHICAGO

"NOW It's an easy job"

THIS is the opinion of every track walker employed by the railroads using HY-CROME to keep their rail joints tight.

Their daily trips over the sections are made considerably easier due to the fact that there is seldom any occasion to use the track wrench.

And because the great reactive force of HY-CROME prevents loose joints there is less work for the rest of the track gang.

Because the track protected with HY-CROME is not subject to those low joint epidemics which keep track forces busy so many months throughout the year.

The savings effected pay a big return on the investment.

The Reliance Manufacturing Company
Massillon, Ohio

Address Dept. M.E.

HY-CROME

"The Most of the Best for the Least"

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 105 W. Adams St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter January 13, 1916, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.
Alphabetical Index to Advertisers, Page 60 Classified Index to Advertisers, 56-58

MAKES TIES LAST

Not Only Longer

but longest—

TO get maximum life from creosoted ties, they must not be cut or wounded after treatment. Whenever creosoted ties are cut, the untreated wood becomes exposed and it is at such points that decay will start.

A tie plate therefore that cuts into the timber defeats its own purpose. Conversely, it is the non-cutting feature that makes the Lundie Plate so desirable.

It gives the desired inclination to the rail, holds track to gauge and above all accomplishes this without cutting a single fibre of the tie.

It is the only essentially flat bottom plate that holds track to perfect gauge. The total absence of destructive projections prevents cutting and insures that maximum return on cross tie investment.

The Lundie Engineering Corporation

285 Madison Avenue, New York

166 West Jackson Boulevard, Chicago

LUNDIE TIE PLATE

WS2—HEAVY DUTY SECTION CAR
8-12 H. P.
Seats 10 men—weighs 1040 pounds

Always Fairmont

Performance on the Job Counts

Readiness! At all times, in all weathers—ever dependable! Like the "embattled farmers" whose shot for freedom was "heard 'round the world," so constancy and readiness in action have broadcast the fame of Fairmont and Mudge Cars. Wherever rails run, they are doing their share toward "freedom" from danger and delay. *Over half of all the motor cars in use are Fairmont Products.*

Twenty years' experience enables Fairmont to solve those problems of design and manufacture on which the success of motor cars depends.

FAIRMONT RAILWAY MOTORS, INC.

General Offices: FAIRMONT, MINN. *General Sales Offices:* CHICAGO, ILL.

Branch Offices: New York City; Washington, D.C.; St. Louis; San Francisco; New Orleans; Winnipeg, Can.
BALDWIN LOCOMOTIVE WORKS, *Foreign Representative*

THE RAILROAD

Minute Men of the Rails - on the job AND Mudge

RAILWAY MOTOR CARS

WORLD KNOWS

FAIRMONT AND MUDGE PRODUCTS

Section Motor Cars
A2—M2—S2—M14
WS2

Inspection Motor Cars
E14—C1—M19—MM9

Weed Mowers and Discers
M24—M23

Weed Burners
B(M27)—C(M27)

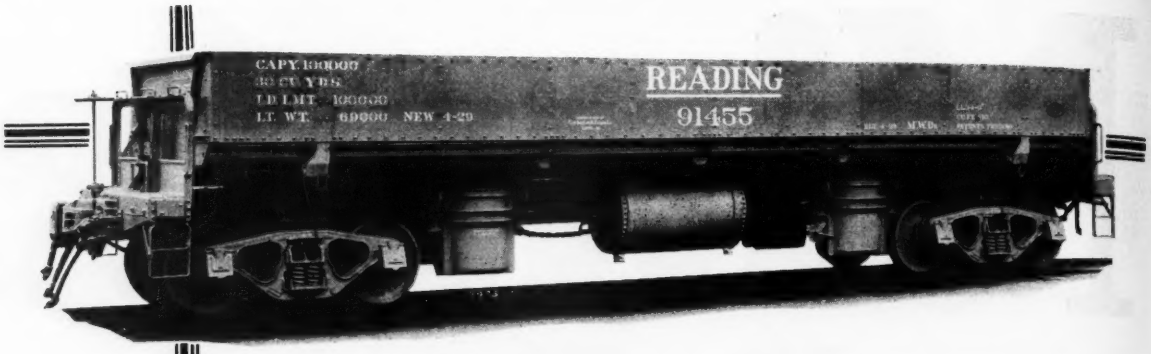
Gang and Power Cars
MT2—A4—A5

Push Cars and Trailers
T1—T2—T3—T12
T20—T24—T25

Roller Axle Bearings
Ringsealed-Axleaver
Bower—Hyatt—Timken

Motor Car Engines
QB—PHB—PHA
QHB and W

Wheels and Axles

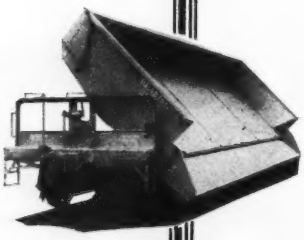


KOPPEL RTD

(Rolling Trunnion Air Dump Car)

Rugged construction to withstand ditcher or heavy steam shovel loading and built to discharge those loads quickly, smoothly, and cleanly.

Its down-turning doors hinged at the floor level of the car assure the load being discharged clear of the track and ballast.



Fool proof—because no locking mechanism is required to hold the body and once back in level position it stays there. An exceptionally low center of gravity assures great stability under all conditions of operation.

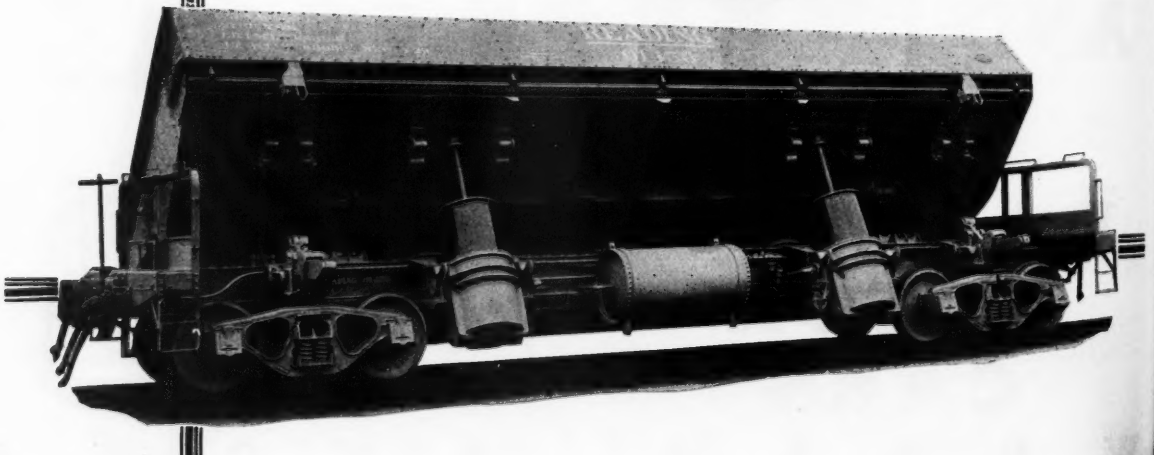
The Koppel RTD is the ultimate in rapid action, low maintenance air dump cars—with an unexcelled factor of safety. Write for detailed information.

Koppel Industrial Car & Equipment Company

KOPPEL, PENNA.

New York Chicago Pittsburgh San Francisco

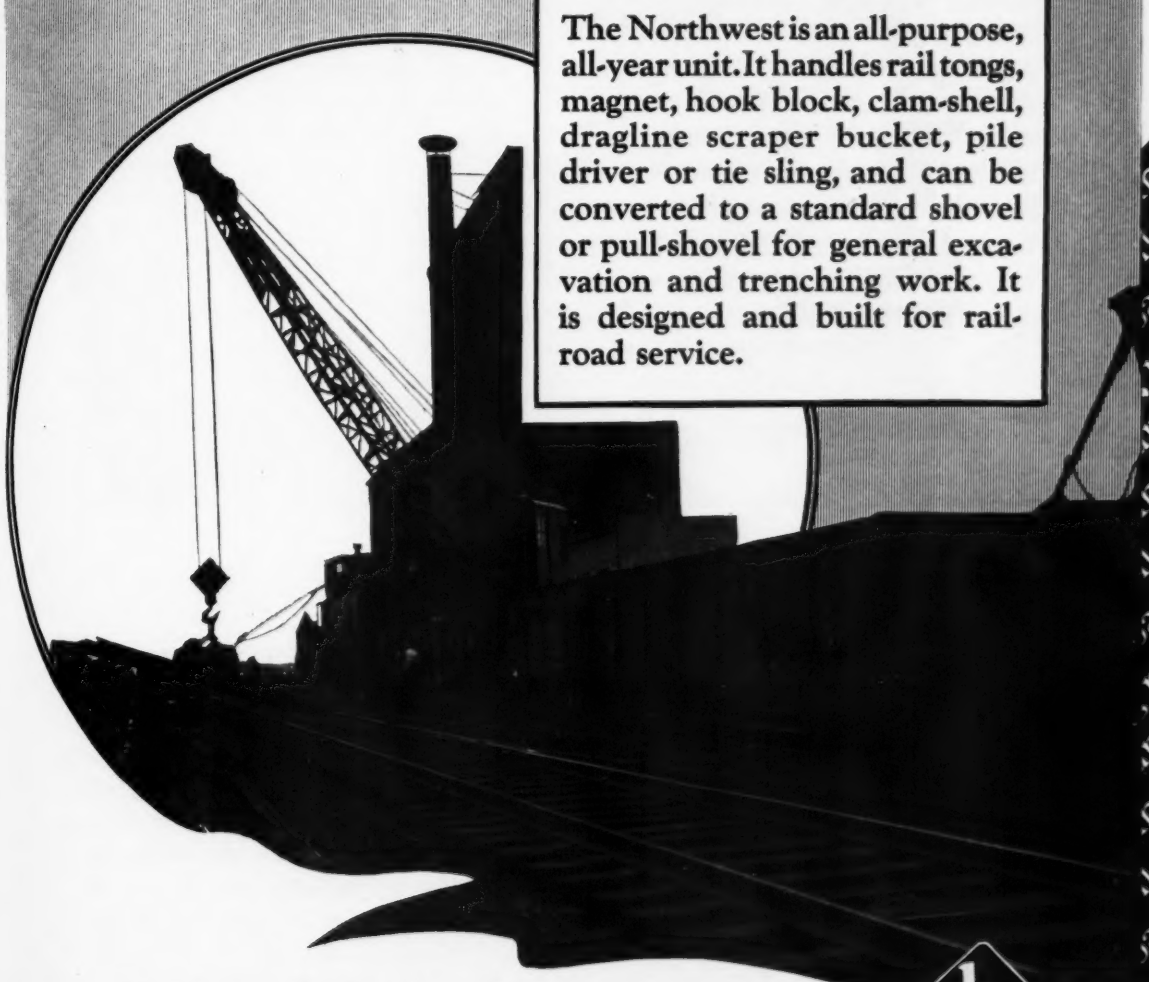
KOPPEL



Distributing Rail

PUT the Northwest Model 3, ¾-yard railroad machine, on your rail distributing problem. With its patented mobility feature you can run it right on a standard drop-end gondola and travel from car to car as each car is unloaded. No need for special steel underframes.

The Northwest is an all-purpose, all-year unit. It handles rail tongs, magnet, hook block, clam-shell, dragline scraper bucket, pile driver or tie sling, and can be converted to a standard shovel or pull-shovel for general excavation and trenching work. It is designed and built for railroad service.



Northwest Engineering Co.

The world's largest exclusive builders of gasoline and electric powered shovels, cranes and draglines

1701 Steger Bldg. 28 E. Jackson Blvd.
Chicago, Ill., U. S. A.

½ ¾ 1 YD 1¼

NORTHWEST

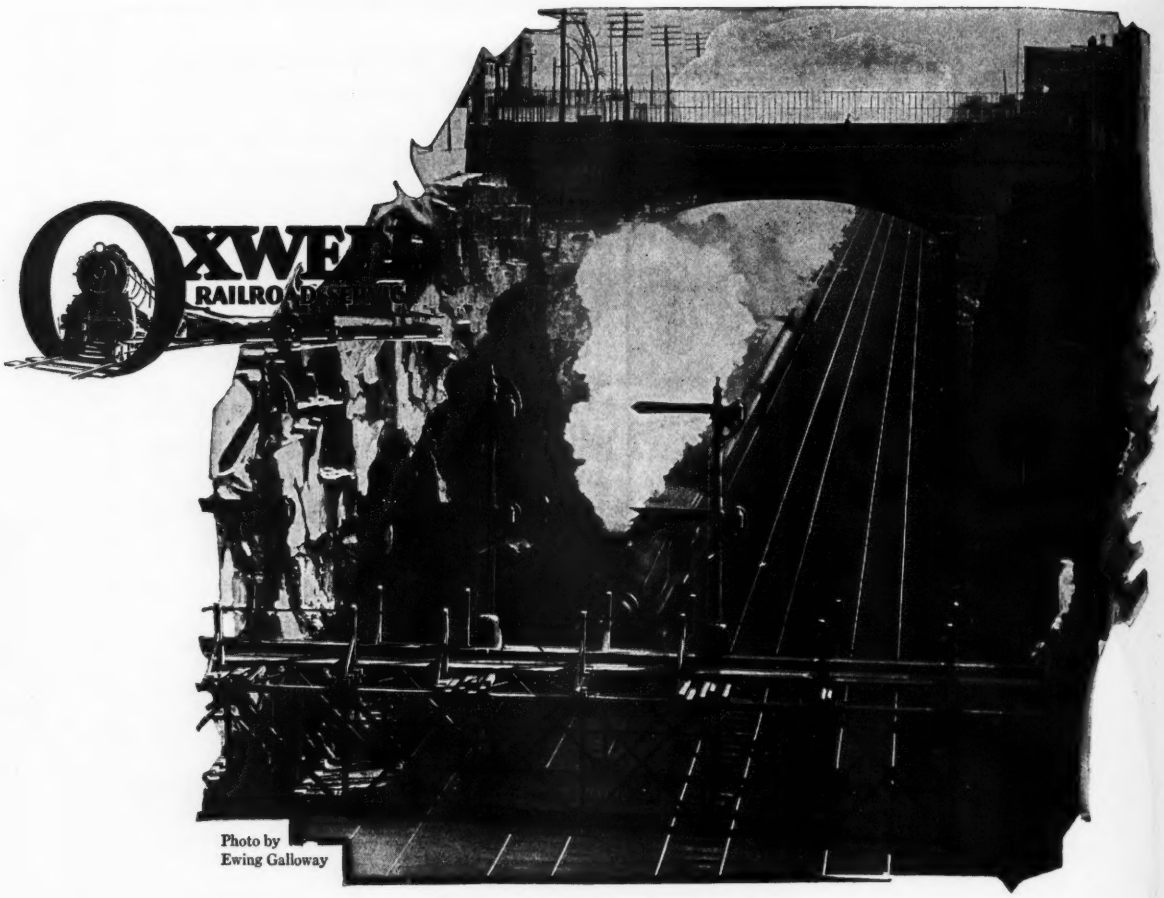


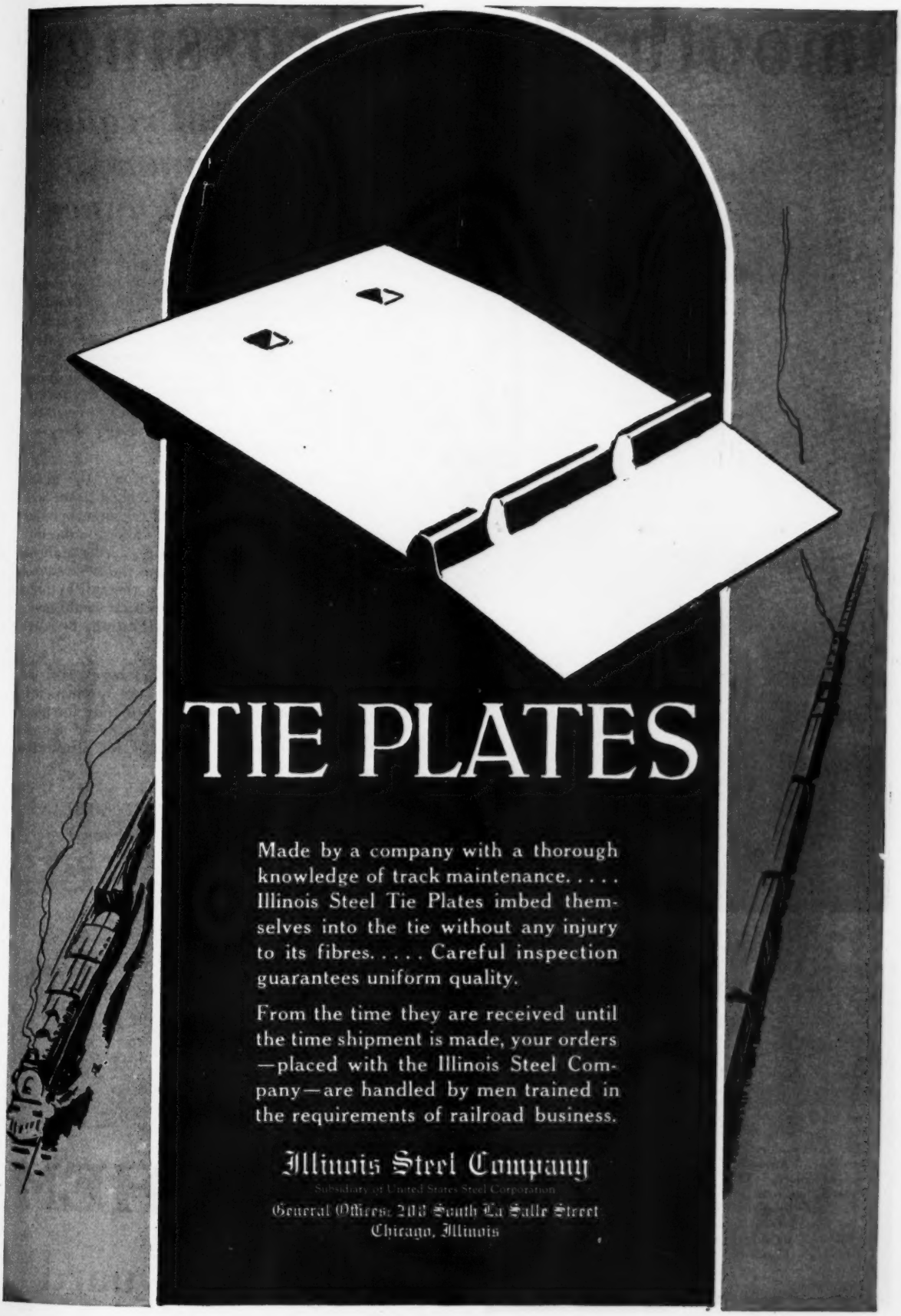
Photo by
Ewing Galloway

High Standards of Maintenance

AT the end of 1928, railway properties were reported to be in the best condition, as regards maintenance, in their history. Viewing this fact, it is especially significant that railway costs for maintenance of way and structures during 1928 were $33,883,739 lower than in 1927 and $32,264,499 under 1926. The operating ratio for this remarkable year was 72.40 against 74.54 for 1927 and an average of 76.79 for the period 1921-1927.

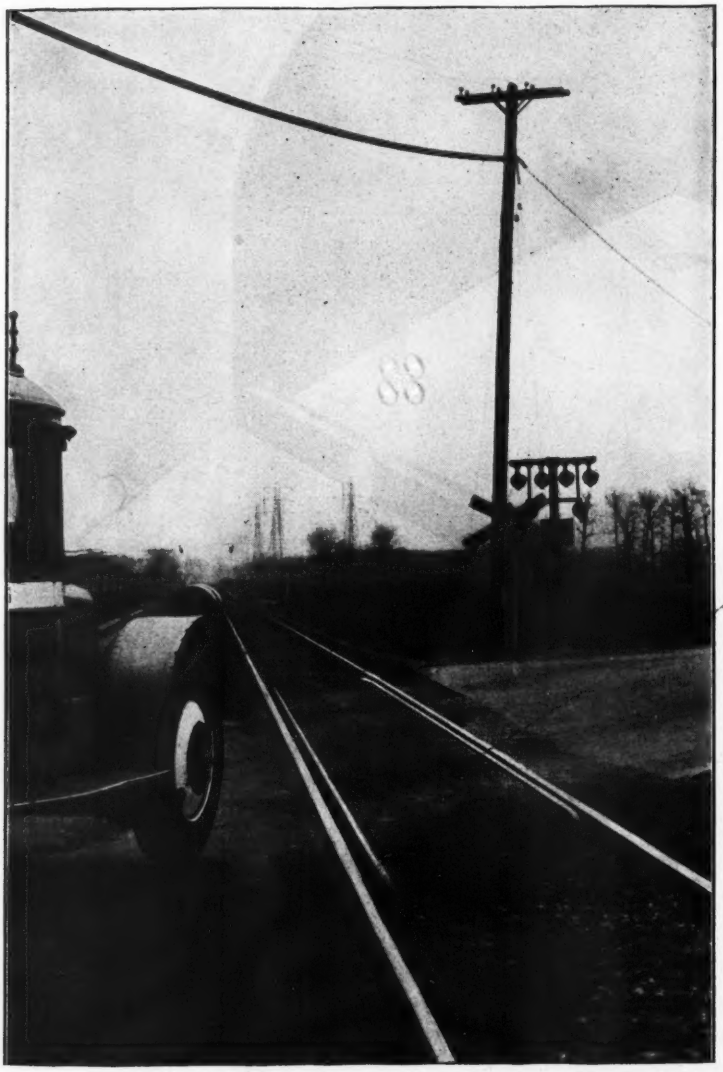
For more than sixteen years The Oxweld Railroad Service Company, by supplying the oxwelding needs of a majority of the important railroads of the country, has been an important factor in the reduction of railway maintenance costs.

THE OXWELD RAILROAD SERVICE CO.
Unit of Union Carbide and Carbon Corporation
UCC
NEW YORK CITY: Carbide and Carbon Building
CHICAGO: Carbide and Carbon Building


TIE PLATES
Made by a company with a thorough knowledge of track maintenance. . . . . Illinois Steel Tie Plates imbed themselves into the tie without any injury to its fibres. . . . . Careful inspection guarantees uniform quality.
From the time they are received until the time shipment is made, your orders —placed with the Illinois Steel Company—are handled by men trained in the requirements of railroad business.
Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices: 208 South La Salle Street
Chicago, Illinois

Smooth, Safe Crossings

that require a minimum of maintenance



Crossing on an important railway system, near Detroit, at which the Bethlehem Flangeway Guard is installed.

The Bethlehem Braced Flangeway Guard makes a safe, smooth crossing, that requires a minimum of maintenance. The Flangeway Guard is spiked directly to the tie and has no contact with the tie plate. Consequently rail vibration and movement are not transmitted to the guard and the paving. Further, because it is firmly braced, the guard will not move under heavy vehicular traffic.

The braces which reinforce the guard against movement are locked to the web of the guard through rectangular openings, and individually spiked to the ties. These braces hold the guard rigidly in position, and eliminate the necessity of attaching the guard to the rail by bolts or other connections which would make it possible for rail vibrations to reach the paving.

The Bethlehem Flangeway Guard assures crossings that are permanently smooth and safe. It will pay for itself over and over again in reduced maintenance expense. Write for illustrated bulletin.

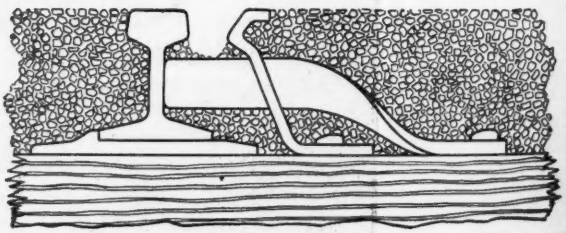
BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland and Honolulu.

Long Sections, Welded on the Job

The Bethlehem Braced Flangeway Guard is furnished in long sections, up to twenty feet, which may be welded together on the job into a continuous, straight, one-piece guard. This one-piece construction and the stiff bracing prevent the guard from bending, loosening or shifting from its original position.



Cross-section of Bethlehem Braced Flangeway Guard. Note that the guard is spiked to the tie and has no contact with the tie plate.

BETHLEHEM
BRACED
Flangeway Guard

"The bog *swallowed the fill* for years . .

. . *but now* it's made harmless with perforated iron subdrains"

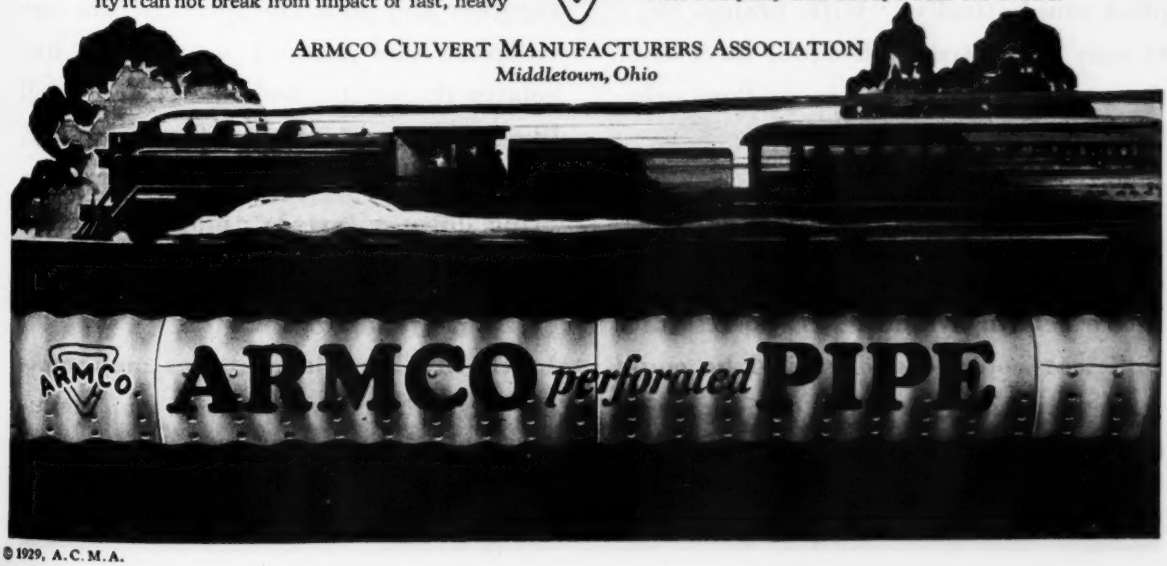
IT was one of those locations that seemed to have no bottom. Every few months construction crews would have to be brought in to bring the track up to grade—and needless to say, the maintenance cost was very high. Today this fill has been stabilized through proper subdrainage. Armco Perforated Pipe has been used to intercept ground water before it can weaken the roadbed.

Armco Perforated Iron Pipe has proved it is particularly adaptable to railway drainage problems. Because of its great strength and flexibility it can not break from impact of fast, heavy trains. Its continuous construction safeguards its high efficiency and prevents disjointing in service. Once an Armco installation is completed there is the assurance of continuous and effective drainage.

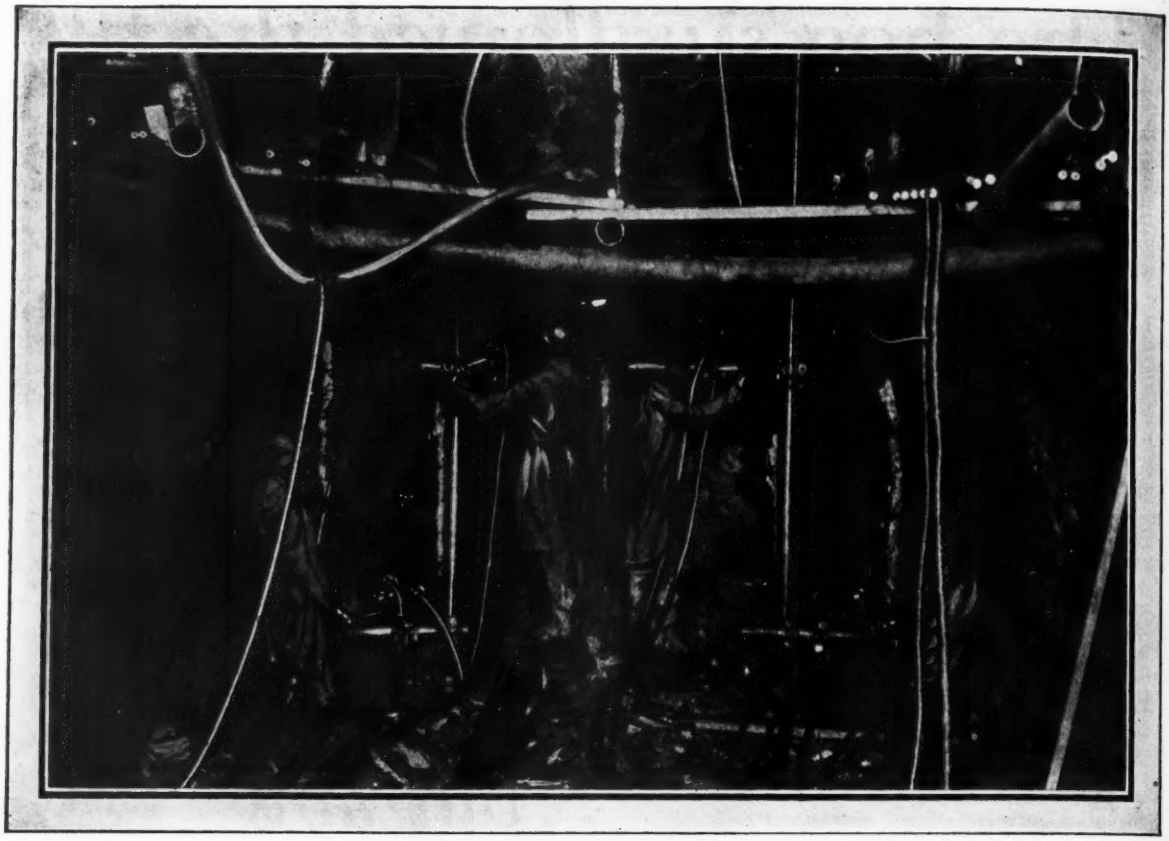
The experience of 23 years is available to you on every Armco drainage project. There is no obligation. Ask for a copy of our booklet "Increasing the Efficiency of Roadbed Drainage."

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio



© 1929, A.C.M.A.



"With brains, sir!"

WHEN Sir Edwin Landseer, the great English painter, was once asked what he mixed his paints with, he replied emphatically, "With brains, sir!" It may be stated with equal force that the essential ingredient in du Pont gelatin dynamite is brains.

There are several well-known works on explosives, from which anyone could get the information necessary to manufacture a gelatin dynamite. If possessed of sufficient courage and capital he could make nitroglycerin — a comparatively simple though somewhat jumpy process; he could make nitrocotton; and he could buy and grind nitrate of soda and wood pulp. He could mix these ingredients together and pack the mixture into cartridges. His product would look like gelatin dynamite, feel like it and smell like it. When detonated in a bore hole, it would make a noise and probably bring down a certain amount of material, but it would not be du Pont gelatin by a long shot.

In the du Pont laboratories and works the ingredients and processes of manufacture for gelatin dynamite have been

DU PONT
REG. U.S. PAT. OFF.

studied for nearly fifty years. To produce nitroglycerin sufficiently pure to give stability to the gelatin requires refinements of manufacture unheard of a few years ago. To make nitrocotton having precisely the nitrogen content and physical characteristics needed is a process extremely difficult to control.

The degree of pulverization of the nitrate of soda and the size of the grain of nitrate of ammonia must be regulated with exactitude to give the plasticity desired. The absorbents, of which wood pulp is only one, must not only be selected with regard to rigid chemical and physical specifications, but ground to a certain fineness and dried to but a fraction of one per cent of moisture.

After all the ingredients have been prepared, the temperature and time of mixing to produce a perfect gelatin must be kept within exceedingly narrow limits which it has taken years of patient experimentation to determine.

Even the weight and chemical composition of the paper wrapping must be taken into consideration to assure the minimum of objectionable fumes.

To fulfill du Pont standards for gelatin dynamite, the stability must be perfect, the strength, sensitiveness and water resistance must be up to specification, the fumes must be held to a minimum, and the plasticity and density must be correct for each particular type and strength of gelatin made.

These standards can be maintained only through highly specialized knowledge and scientific manufacturing control. The du Pont oval on a cartridge of gelatin guarantees that it has been made with this knowledge and this control as well as with the ingredients named in the formula.

E. I. du Pont de Nemours & Co., Inc.

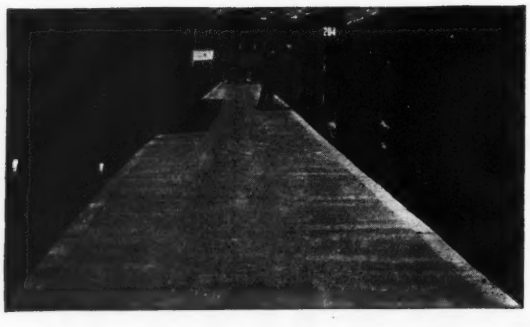
Explosives Department

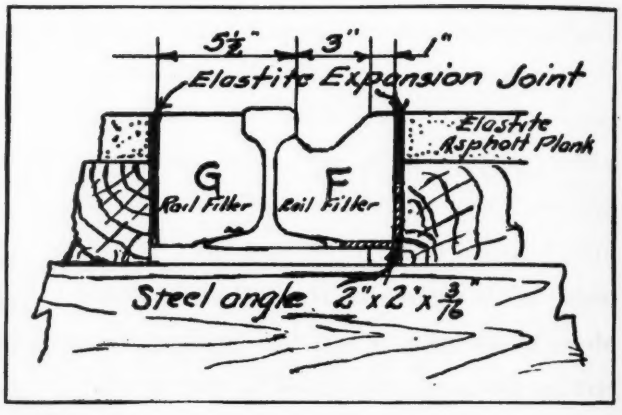
Wilmington Delaware

GELATIN DYNAMITE

Everywhere

railway construction and recommending these





Carey Elastite

PAVEMENT FOR CROSSINGS ...2"-thick sections of Carey Elastite Asphalt Plank and sections of Carey Rail Filler, made of a fibrous asphaltic compound that knits and heals under traffic. Preformed, cut to fit—easily installed, in any weather, with ordinary tools. Traffic impact keeps it in condition—makes it practically water-tight.

Carey Elastite

ASPHALT PLANK...used and recommended everywhere for the flooring of bridges and loading platforms. Made of a fibrous asphaltic compound—preformed—cut to fit and delivered ready to install over any sub-structure. Quiets structural noise, minimizes vibration. Effective also for warehouse flooring use.

Carey Elastite

EXPANSION JOINT...made of a Carey-blended asphalt body, bonded under tremendous pressure between two substantial slabs of asphalt-saturated

◆ ◆ ◆

executives are specifying advanced Elastite products

TRADE MARK REG'D. U.S. PATENT OFFICE

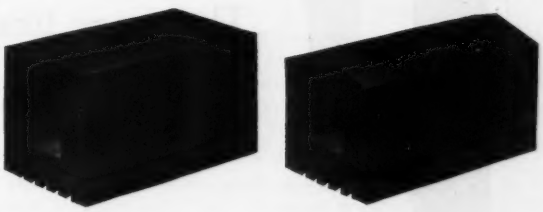
felt. Frost-tight, water-tight, impervious to broiling sun. The pioneer "sandwich" joint—perfect protection against expansion and contraction strains.

Carey Elastite

WATER-PROOFING PROTECTION... preformed slabs of a fibrous asphaltic compound indifferent to climatic change. Can be obtained in wide variety of lengths, widths and thicknesses, and applied with ordinary tools and labor. Cannot creep or chatter off—neither can it warp, crack or decay.

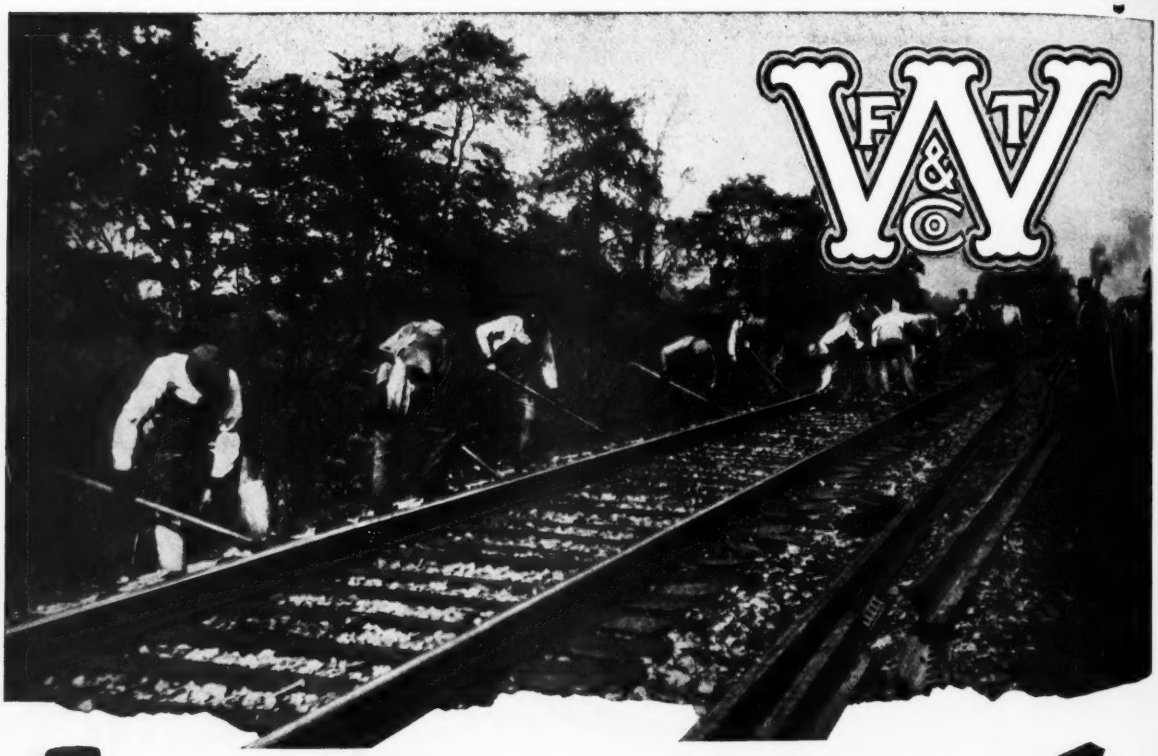
Carey Elastite

TRUNKING... far superior to wood trunking; grainless—it cannot warp or check. Holds nails tight—even preserves them. Vermin-proof, water-proof, fire-resistant. Unaffected by brine, acids and alkalis. Immune to decay. Being of asphalt, fibre and mineral composition, it cannot injure rubber insulation.



IT will pay you to know the complete Carey line—how little Carey products add to the cost of the finished job and how much they subtract from maintenance. The services of Carey representatives are at your disposal.

THE PHILIP CAREY COMPANY, *Lockland*, CINCINNATI, OHIO



Tools at Their Best

Woodings Track Tools are all standard design.

Made from the very best steels obtainable by expert workmen, using the most modern methods of heat treating.

They save time, labor and avoid accidents.

Woodings Forge and Tool Co.

Works and General Sales Office

Verona, Pa.

WOODINGS
STANDARD TRACK TOOLS

"Standard"
adds the charm of color
to the zest of travel

Famous trains now add a new allurement to the zest of travel through the use of "Standard" Plumbing Fixtures in rich shades of color. These well known plumbing fixtures now may be obtained for railway use in ten delightful colors; among these Ionian Black and Meissen White.

Not strange, is it, that travelers find this note of color altogether pleasing? For in the nation's better homes they are of course accepted as the newest, most delightful vogue. Beyond all question color is preferred by these progressive people for its true refinement and its subtle harmonies of tone.

Your better trains, if lacking in these newest plumbing fixtures, may be equipped with them without great extra cost or inconvenient layup. "Standard" Railway Plumbing Fixtures are designed expressly for today's railway needs. This department offers a complete, fully-rounded service that will place before you facts and figures on the cost of modernizing your existing de luxe trains with "Standard" Plumbing Fixtures in these new and pleasing colors: T'ang Red, Ming Green, Royal Copenhagen Blue, Ionian Black, Clair de Lune Blue, Rose du Barry, Orchid of Vincennes, Ivoire de Medici, St. Porchaire Brown and Meissen White.

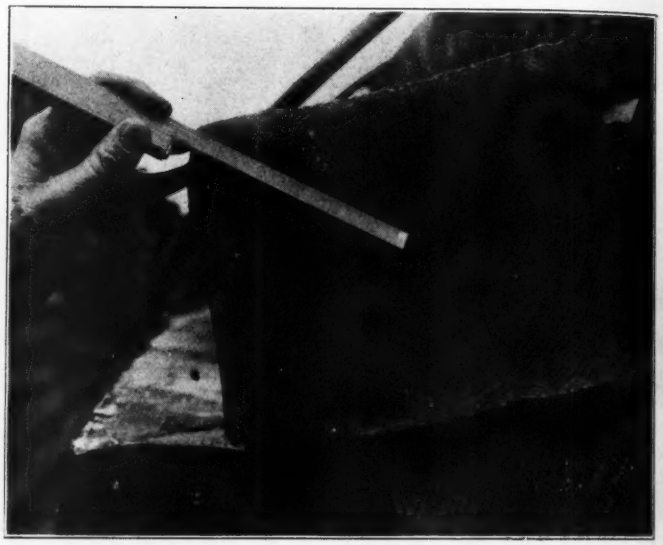
No matter what your needs may be, we're ready now to serve you. Our catalogue, mailed on request, contains valuable information. Write now.

Standard Sanitary Mfg. Co. PITTSBURGH
Railroad Fixture Department

"Standard"
PLUMBING FIXTURES

THE LARGEST MANUFACTURER OF PLUMBING FIXTURES IN THE WORLD

They ALL have to be right—
. . . the wood . . . the creosote
. . . the treatment



NOT ONE item of material, not one phase of operation, can be half right in the production of dependable treated structural timber, piles, poles, ties, posts and subflooring and in the delivery of these products to the trade on dependable schedule. For quality and service, they all have to be exactly right.

An ample and certain supply of good timber (J. F. Prettyman & Sons own 60,000 acres of choice Southern Yellow Pine) . . . the skilled services of its timber experts and treating engineers . . . one of the most complete and modern creosoting plants in the industry . . . unfailing sources of high grade creosote oil supply . . . excellent shipping facilities by rail or water—all these and more are placed at your command by this alert and progressive wood preserving organization.

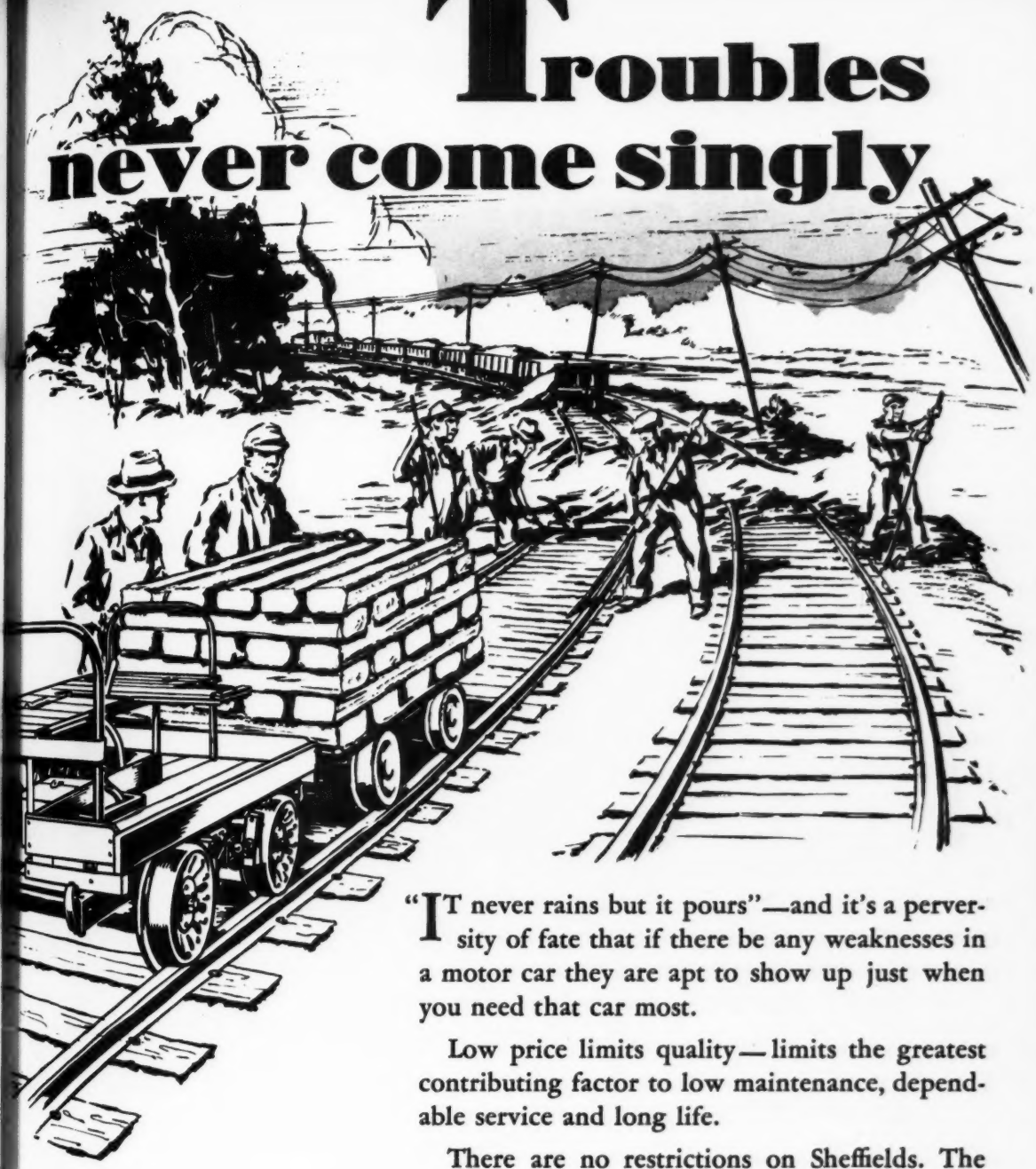
And not only is each of them right, but all of them are perfectly co-ordinated for swift and accurate service to you. On large orders for delivery in shipload lots or small ones for rail or barge delivery, we are prepared to serve you promptly with material guaranteed to meet your specifications.

Write today for prices and information.

PRETTYMAN PRESERVED FOREST PRODUCTS P29

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

Troubles never come singly



"IT never rains but it pours"—and it's a perversity of fate that if there be any weaknesses in a motor car they are apt to show up just when you need that car most.

Low price limits quality—limits the greatest contributing factor to low maintenance, dependable service and long life.

There are no restrictions on Sheffields. The quality that is built into them tells its own story in service rendered. Their *first* cost *must* be a trifle more, but those few dollars on the purchase price have saved railroads thousands in maintenance and even more by dependable service in emergencies.

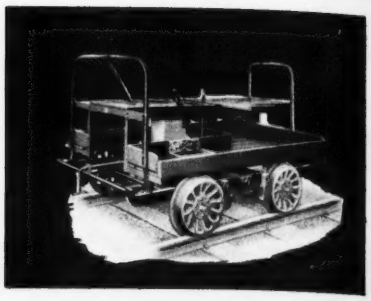
TIMKEN BEARING EQUIPPED

FAIRBANKS-MORSE MOTOR CARS

First on the rails—and still first

FAIRBANKS-MORSE MOTOR CARS

FAIRBANKS-MORSE MOTOR CARS



"Figure "Sheffield" Quality in savings dividends

Sheffield quality is an investment that brings dividends. The proof is a matter of record. Railroads that have kept a careful check have found that Sheffield quality is a definite feature that can be figured in lower maintenance.

Appreciation of these savings dividends has been generously expressed in orders. The past few years have seen the greatest increase in Sheffield sales in Sheffield history.

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; Diesel engines—stationary and marine; electric motors and generators; steam, power and centrifugal pumps; scales and complete coaling stations.

The Sheffields that inspired such confidence were good cars. But the Sheffield organization never rests on its laurels. They have developed many new refinements that make Sheffields the outstanding value in Railroad Motor Cars today.

FAIRBANKS, MORSE & CO., *Chicago*

FAIRBANKS-MORSE MOTOR CARS

TIMKEN BEARING EQUIPPED

F M

RA21-10

ENDURANCE

A SOUND OPERATING PRINCIPLE RETARDS MECHANICAL DEPRECIATION AND MULTIPLIES THE YEARS OF SATISFACTORY SERVICE

For over thirty years the name Buckeye has identified dependable construction equipment. Every unit bearing this name has been developed to meet some particular need. A proven product, tested by time and service, it embodies an accepted operating principle that pre-determines long, efficient duty. Every day the Buckeye Utility Crane pays its way. It may be as clamshell, orange-peel, dragline or crane, for its remarkable usefulness is limited only by the ingenuity of its operators.

Standard features include: Two speeds for all operations; Timken roller bearings; industrial type motor; full-circle swing; one-man control; and adjustable length boom. These and others are eloquent evidence of Buckeye super construction. Two mountings are available—*flanged wheels*, permitting operation from track or rails laid on flat cars, and *Alligator (crawler) traction* for service independent of track. We will gladly furnish complete details of construction and performance data—interesting literature sent on request.

THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO

There's a Buckeye Sales and Service Office Near You

for over thirty years
Buckeye

Here's a 100 foot doorway without center posts!!

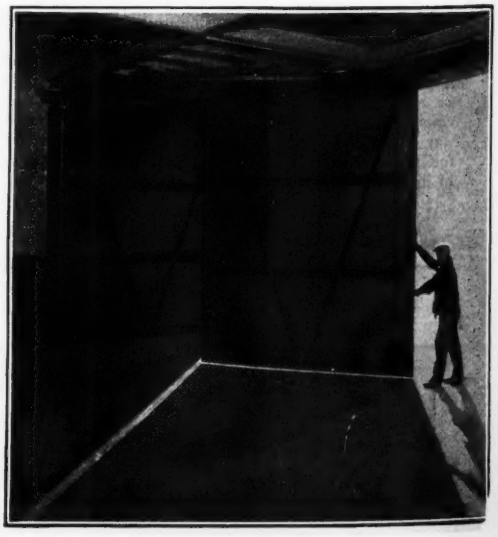
Hartman Fruit & Produce Co., St. Louis, wanted an indoor loading platform which could accommodate as many as 12 motor trucks at a time. They wanted an opening to the street 100 ft. wide, without posts or other obstruction to hinder the movements of trucks.

They put it up to their architect, Laurence O. Schoop, who designed the splendid modern building they now occupy. Mr. Schoop called in a Richards-Wilcox engineer. So far as the architect knew, this was the widest opening in the world calling for doors without any posts.

R-W engineers designed equipment for the doorway—ten wood doors with steel frames save weight without sacrificing rigidity, making it easy for one

man to open or close them. A cleverly devised arrangement of R-W track makes it possible to open five doors to each side, occupying less than 4 ft. of space when opened.

An opening large enough for one truck can be made at any point in the entire 100 ft. span without throwing the whole doorway open. The doors move smoothly and easily, but stay where they are put. They cannot be moved by the wind, and have not given the slightest trouble.



The tenant enjoys the convenience of loading trucks indoors, protected from inclement weather, and of having a wide doorway for trucks, free from posts or other obstructions.

Perhaps you have doors which give trouble, or an opening where scientifically designed, smoothly operating doors would be an asset? Don't say, "It can't be done!" Call in a Richard-Wilcox engineer.

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

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Six Men Now Do the Work of Thirty

Why should we keep a big crew of laborers at the plant to handle materials that are really heavier than a man should lift? Why add this unnecessary burden to our overhead when it only handicaps production?

A little thought along this line sometime ago led to one of the leading railroads installing a fifteen-ton gas crawler crane to handle scrap and miscellaneous materials. The result...a foreman, crane operator and four men replaced a crew of thirty and the work is now done better and much easier. In addition, the Industrial Brownhoist handles other materials in every part of the yard in its spare time.

Obsolete handling methods are eating into profits today in scores of ways; each plant having its own problems. Our representatives have found the answer to thousands of such cases—a few minutes of your time with one of them would be well repaid.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

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INDUSTRIAL BROWNHOIST

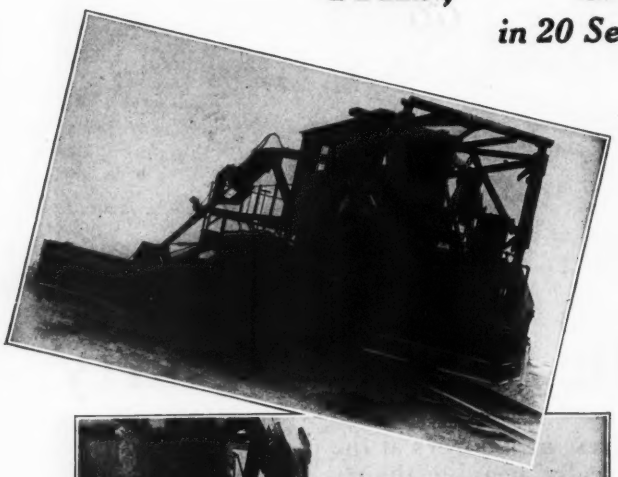
JORDAN SPREADER

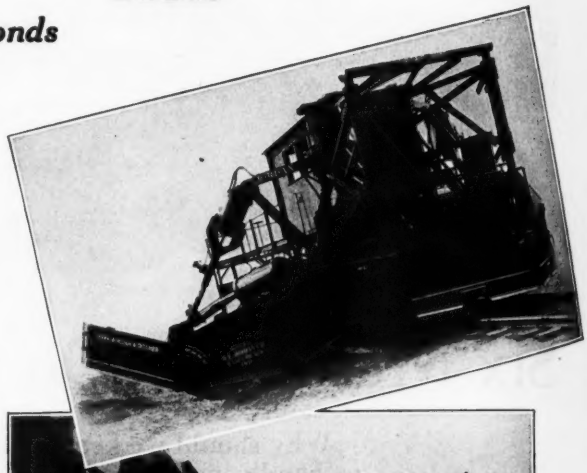
A SPREADER AND DITCHER IN ONE

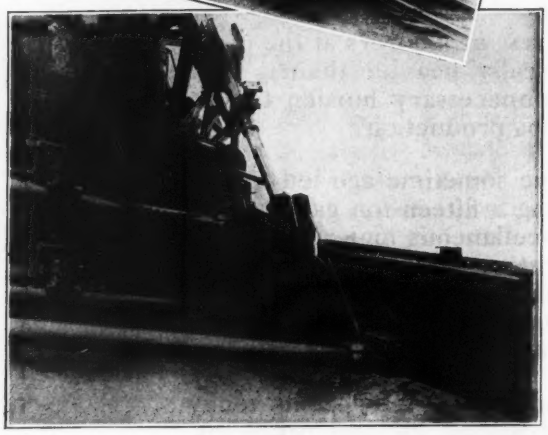
Do you know that the new type "A" Jordan can be made either a Spreader or a Ditcher in a jiffy?

THIS, or THIS

in 20 Seconds



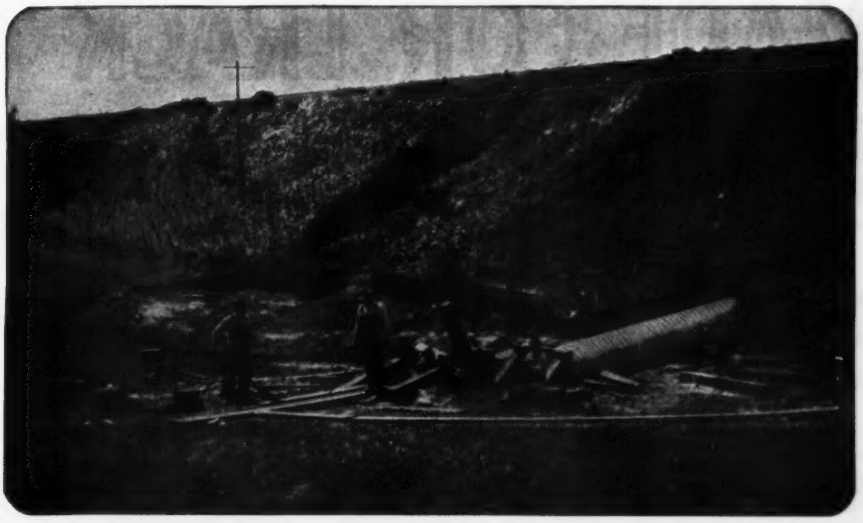




A grade can be established in a ditch bottom without disturbing the subgrade or ballast slopes by means of a mechanically operated ditch cutting section. This can be done from the operator's cab.

JORDAN SPREADER
"Does the Work of an Army of Men"
SNOW PLOW ★ ICE CUTTER
DITCHER
O.E. JORDAN COMPANY
WALTER A. RILEY, PRESIDENT
EAST CHICAGO, INDIANA

Wing braces are telescopic and wing can be set to any width within the maximum spread from operator's cab.



Jacking A Toncan Iron Culvert Thru A Fill

IMPROVING drainage facilities is no longer the expensive, tedious process it once was.

Culverts of Toncan Iron can now be worked thru a heavy fill at low cost by the jacking method, without interruption to traffic.

Pressure is applied by means of jacks acting against the end of the culvert which are protected by 2 x 4's. Earth is removed by sluicing with a hose if the culvert is small and by pick and shovel if large enough to accommodate a man. Complete instructions will be gladly furnished on request.

And once in place remember that the Toncan Iron culvert lasts longer due to its greater resistance to rust and corrosion—gained by alloying refined iron with copper and molybdenum.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION, MASSILLON, OHIO.

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Tri-State Culvert Mfg. Co. Atlanta, Ga.
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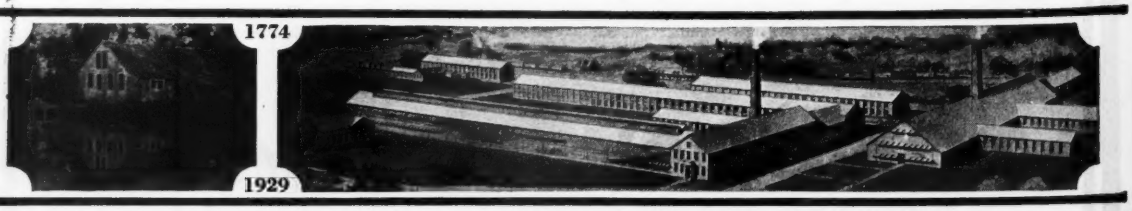
TONCAN COPPER MO-LYB-DEN-UM IRON

MADE FOR TRACK MAINTENANCE

MORE AMES SHOVELS are USED than any other kind

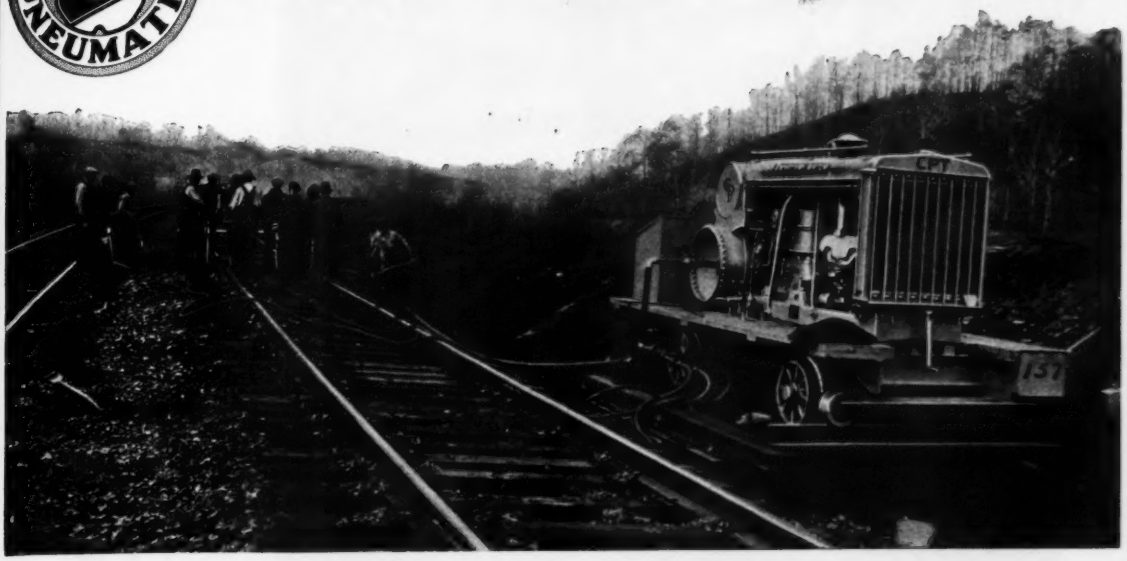
The complete "All Star" Ames line covers every shovel need.
It will pay you to "look for the stars" on every shovel you buy.



AMES SHOVEL AND TOOL COMPANY
NORTH EASTON ◂▸ MASSACHUSETTS
ST. LOUIS, MISSOURI . . . ANDERSON, INDIANA

3063

SELF-PROPELLED COMPRESSOR and "STRAIGHT BACK" TIE TAMPERS



On The Job

MANY railroads are using these units because of their convenience, speed and reliability. The standard CP Compressor is mounted on a truck frame carrying flanged wheels with Timken roller bearings, transverse shifting wheels and winch, air-operated lifting jacks, lifting bale and a roomy tool box. The gasoline engine that operates the compressor also propels the car at a speed of 12 to 18 miles per hour, depending upon its size. The compressor is furnished in sizes of 110, 160, 220, 265 and 310 cu. ft. per minute displacement. The CP Tie Tampers have several interesting features that are fully described in folder No. 1646. Details of the Self-Propelled Compressors are given in Bulletin No. 789.

Chicago Pneumatic Tool Company

Railroad Department

6 East 44th Street, New York
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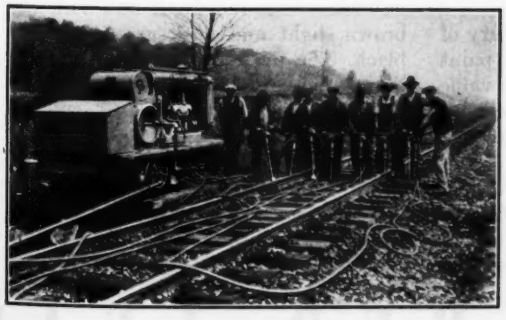
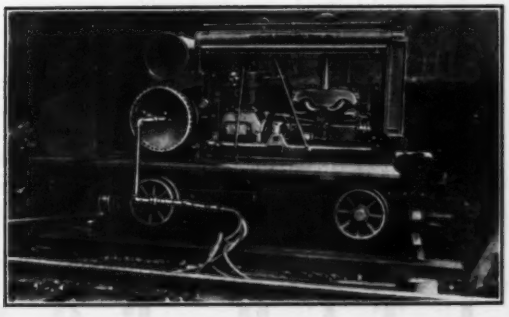
175 First Street, San Francisco
310 S. Michigan Ave., Chicago

J-293





RUST-PROOFED!

when the paint is pure Red-Lead

TRADEMARKED LEAD PIPE

Lead pipe of our manufacture now carries the Dutch Boy trademark and also National Lead Company's name. This marking, stamped into the pipe every few inches, is your assurance of quality, proper wall thickness and correct weight per foot.

WHERE steel-work must serve unweakened for many years . . . on bridges, ships, tanks, steel structures of every type . . . there you find paint made of pure red-lead used.

Tested by more than a century of universal use, pure red-lead paint has proved its high protective value . . . its remarkable ability to prevent rust . . . its extreme durability even under severe conditions. It is recognized by paint authorities everywhere as the standard protective paint for metal.

Fine, uniform, highly oxidized . . . there is no better red-lead obtainable than Dutch Boy red-lead. It comes in two forms . . . paste and liquid. The liquid (ready for the brush) is supplied in six colors—natural orange-red, light and dark brown, light and dark green, and black. The paste comes in natural orange-red and can be shaded to dark colors.

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DUTCH BOY RED-LEAD

RAILS & SPLICES

Into every rail and splice bar manufactured by this company the name "Carnegie" is rolled. This name on steel represents years of conscientious effort to give steel users better products—it represents control of manufacture from the mining of the ore to finished product—it represents unlimited facilities for proper manufacture—it represents the work of experienced metallurgists—the pride of skilled workmen in their craft. It represents a friendly spirit of service and cooperation. Carnegie Rails and high carbon, oil quenched Splice Bars bear this name—our guarantee of your satisfaction. Whether your order be small or large, you may expect the same prompt and efficient service.

Let us quote on your next requirements

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Subsidiary of United States Steel Corporation

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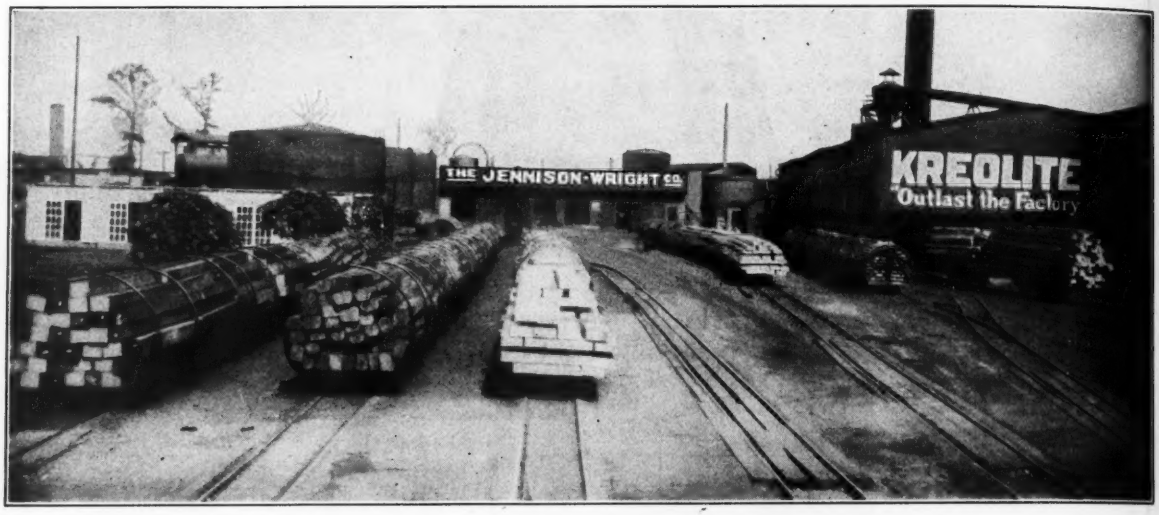

We Distill Our Own Creosote Oil

By so doing it is possible for us to insure to the purchaser a uniform pure product of any grade desired. We have treated hundreds of millions of feet of timber in the past 17 years without a single instance of decay.

By the installation of the latest and most modern framing and boring machinery, we assure the purchaser of timbers most accurately framed at lowest cost.

Enormous stocks of Cross Ties, Switch Ties, Structural Timbers and Piling, in all sizes, in Solid Oak or Pine, properly sticked and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant at Granite City, Ill., (East St. Louis).

THE JENNISON-WRIGHT COMPANY, Toledo, Ohio

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R.R. TIES

WHEREVER WHEELS AND SHAFTS TURN

Industry's profile cuts the sky—express trains glide by—traffic whistles shriek, sirens snort, bells clang. In the thick of industry and transportation are Timken Bearings in railroad and street car journals, electric motors, buses, trucks, motor cars and machinery of all kinds—saving lubricant, reducing friction, and prolonging machine life.

Where roads are to be made, rivers bridged—where men mine the earth or use its soil for growing grain or pierce it deep to tap the oil supply—there again are Timken Bearings and Timken benefits.

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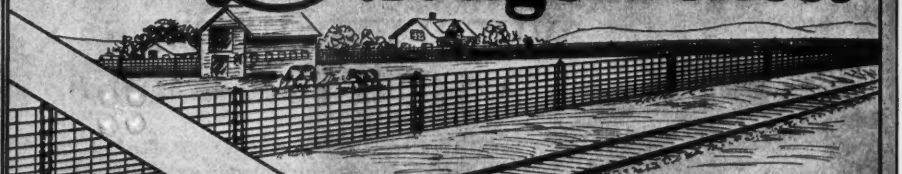
For wherever power is applied through moving parts, Timken Bearings are bettering the work of the world—cutting costs and increasing production wherever wheels and shafts turn.

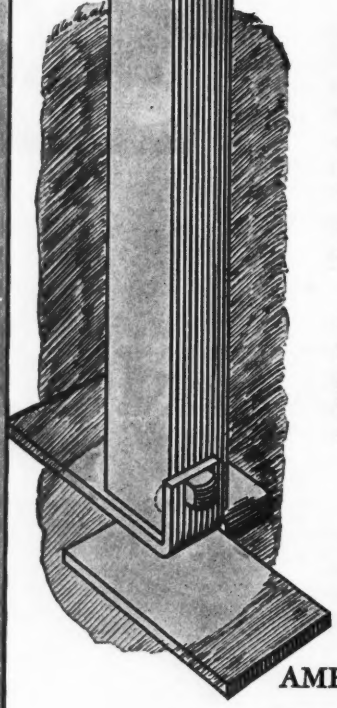
THE TIMKEN ROLLER BEARING COMPANY
C A N T O N , O H I O

TIMKEN *Tapered Roller* **BEARINGS**

Think of what it means in Saving Time Saving Work and in Stronger Fences



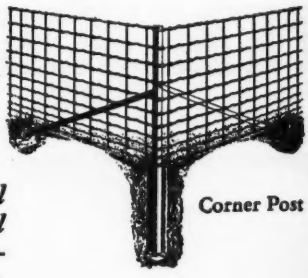
The NATIONAL Dirt Set *Expanding Anchor* End & Corner Posts



SOMETHING entirely new in end and corner post construction—the National "Dirt Set" Expanding Anchor Angle Steel Posts. With their use—no cement is needed—no water to haul—no waiting for concrete to "set." You can set these end and corner posts and go right ahead with stretching the fence.

Simple—Time Saving—Economical. The Expanding Anchor is an exclusive feature and is one of the greatest improvements offered in years of fence construction. Catalog sent on request.

End Post



Corner Post

ALSO

Woven Wire Right-of-Way Fences—Steel Line Posts—Wire Nails—Spikes—Steel Gates—Electrical Wires and Cables—Wire Rope — Rail Bonds — Springs.

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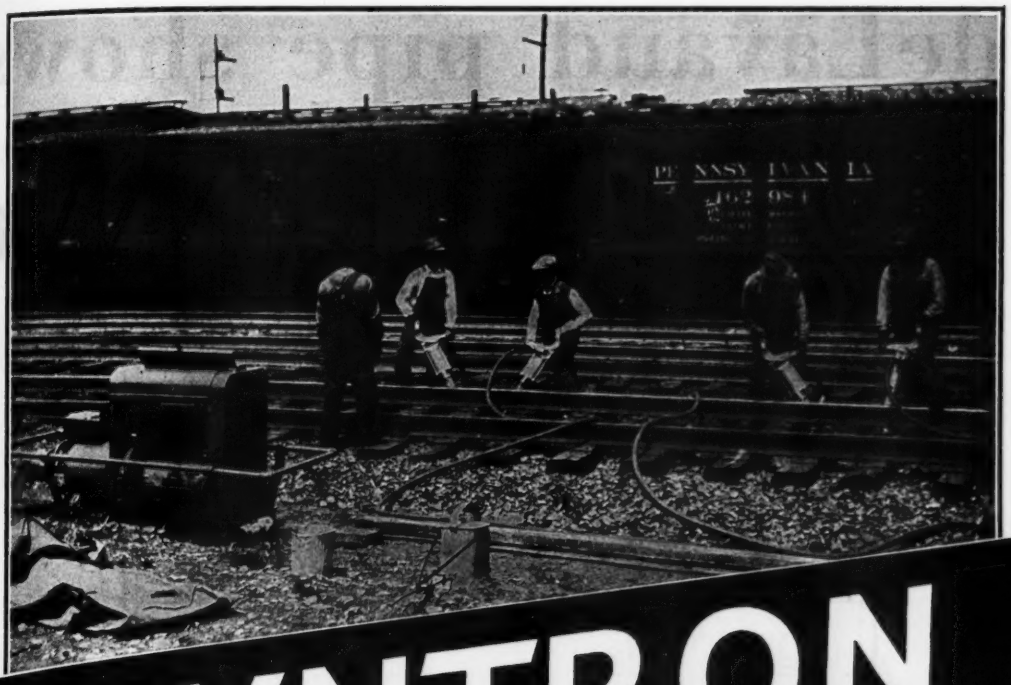


SYNTRON
Electric Tie-Tamping Outfits

Here is Decided Economy in Track Surfacing

WATCH a SYNTRON Electric Tie-Tamping Outfit in operation. Keep a record of its amazing saving in time, labor, gasoline. Note its extreme practicability, its ease of handling, its flexibility. Watch how easily one man can do the work of four with tamping picks, delivering 1500 speedy, powerful blows a minute, doing a faster, better, easier job of tamping.

Then you will know why so many roads are adopting this common-sense method of track tamping.

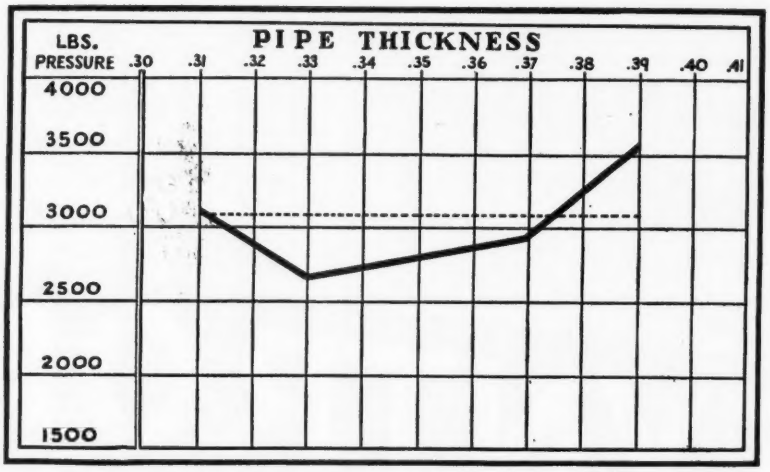
The SYNTRON Tamper is a motorless unit, having only one moving part, is light in weight, rests easily on the lap and does not tire the operator.

The SYNTRON Power Unit is the most compact gas-electric power source on the market. It is easily lifted by 4 or 5 men, rests on the track shoulder, needs no special equipment for moving and operates a large number of electrical labor-saving tools.

For decided economy, look to *Syntron*.

SYNTRON COMPANY 400 LEXINGTON AVENUE PITTSBURGH, PENNA.

*deLavaud pipe shows *an average internal resistance* of 3090 lbs. per square inch



* The above graph is based on tests performed by a well-known Testing Laboratory. These tests show that deLavaud Pipe is over 25% stronger than good pit cast pipe. The dotted line represents the average bursting pressure of 6" deLavaud pipe of representative thicknesses.

THE superior strength of deLavaud pipe becomes more surprising when one considers the increased carrying capacity which this pipe offers. On the graph shown above, you will note that the average thickness of the deLavaud pipe tested is thirty-five one-hundredths of an inch. Yet, this pipe exceeds by 25% the strength of any pit cast pipe designed for equal working pressures.

deLavaud pipe is made by pouring molten metal into a cylindrical mould which is revolving at a high rate of speed. Centrifugal force holds the metal against the mould and drives out impurities *with a force 40 times greater than gravity.*

Therefore, deLavaud cast iron has a dense close-grained structure and freedom from gas bubbles and impurities. In addition, the quick cooling of the surface metal in the deLavaud water-cooled mould helps bring about the finely divided condition of the graphite in the iron.

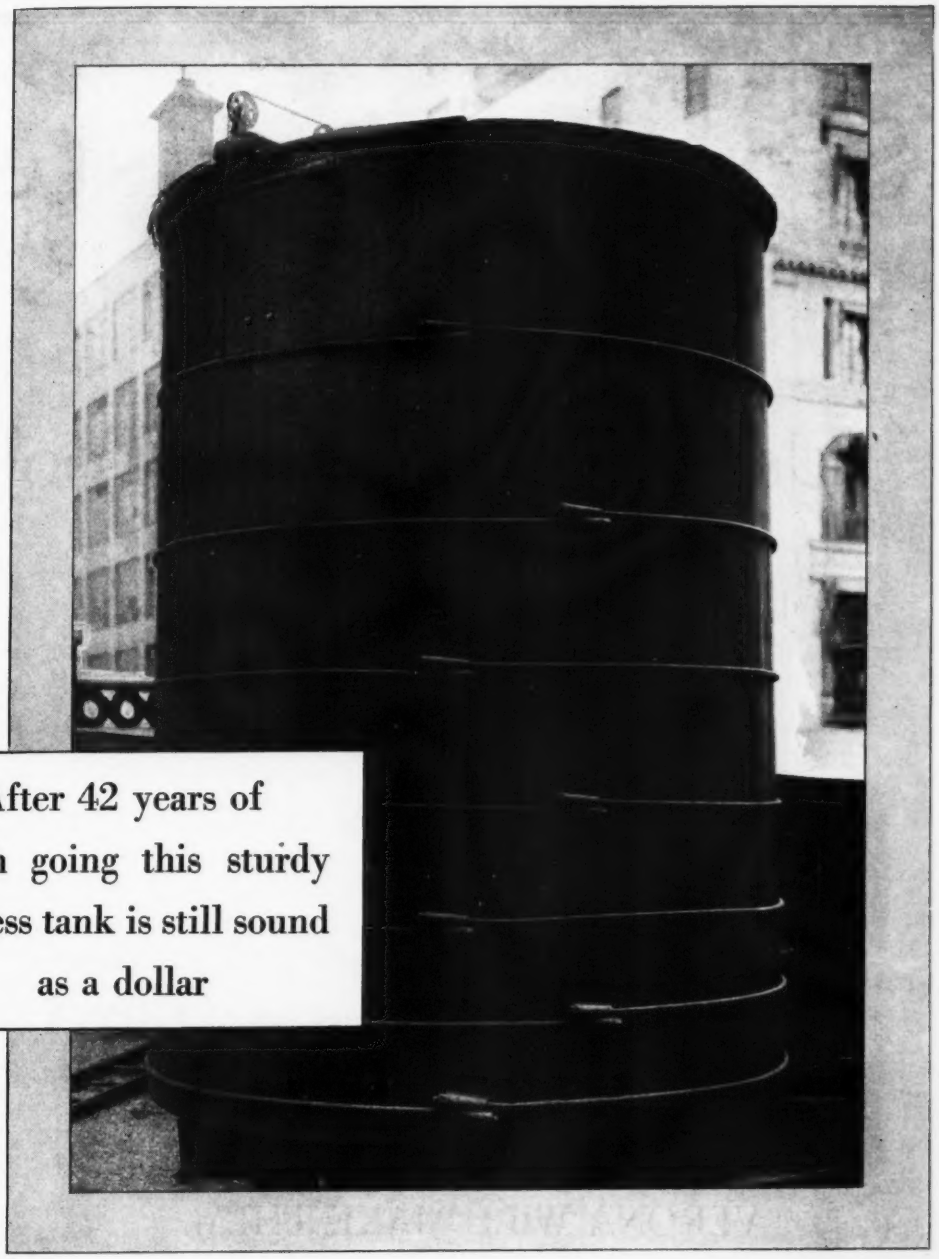
So remarkable have been the results of strength tests conducted on deLavaud Pipe that it is difficult to describe them without using extravagant-sounding comparisons. Suffice it to say that the great strength of deLavaud has never been equalled by any pit cast pipe.

Let us send you further facts and figures about deLavaud Pipe. Our free, illustrated handbook gives detailed information regarding types of joints and dimension tables. Write for your copy today.

Cast iron pipe made by this Company bears the "Q-check" trademark of The Cast Iron Pipe Research Association.

United States Pipe and Foundry Co., Burlington, New Jersey

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles



After 42 years of tough going this sturdy cypress tank is still sound as a dollar

PERCHED on top of the Bodmann Building in Cincinnati, this Hauser-Stander Tidewater Red Cypress tank has rebuffed moisture inside and out for almost half a century.

In hundreds of railroads throughout the country, this same durable lumber is cutting down operating expenses on every mile of line.

More and more every year, railroad men employ Tidewater Red Cypress for passenger station construction, freight sheds, warehouses, ties, platforms, signal conduits, water tanks, box cars, fencing, and, in short, any use where long life and freedom from repairs are essential.

Technical data will be supplied gladly by the Southern Cypress Manufacturers' Association, Jacksonville, Florida.

TIDEWATER RED CYPRESS

THE WOOD ETERNAL

Stop-Look-Listen

For Safety
Use Verona Track Tools

Stop your waste on tools by using VERONA QUALITY TOOLS.

Look at VERONA QUALITY before purchasing tools.

Listen to the testimony and praise of thousands of satisfied users of VERONA TOOLS.

When BETTER TOOLS are made VERONA WILL MAKE THEM.

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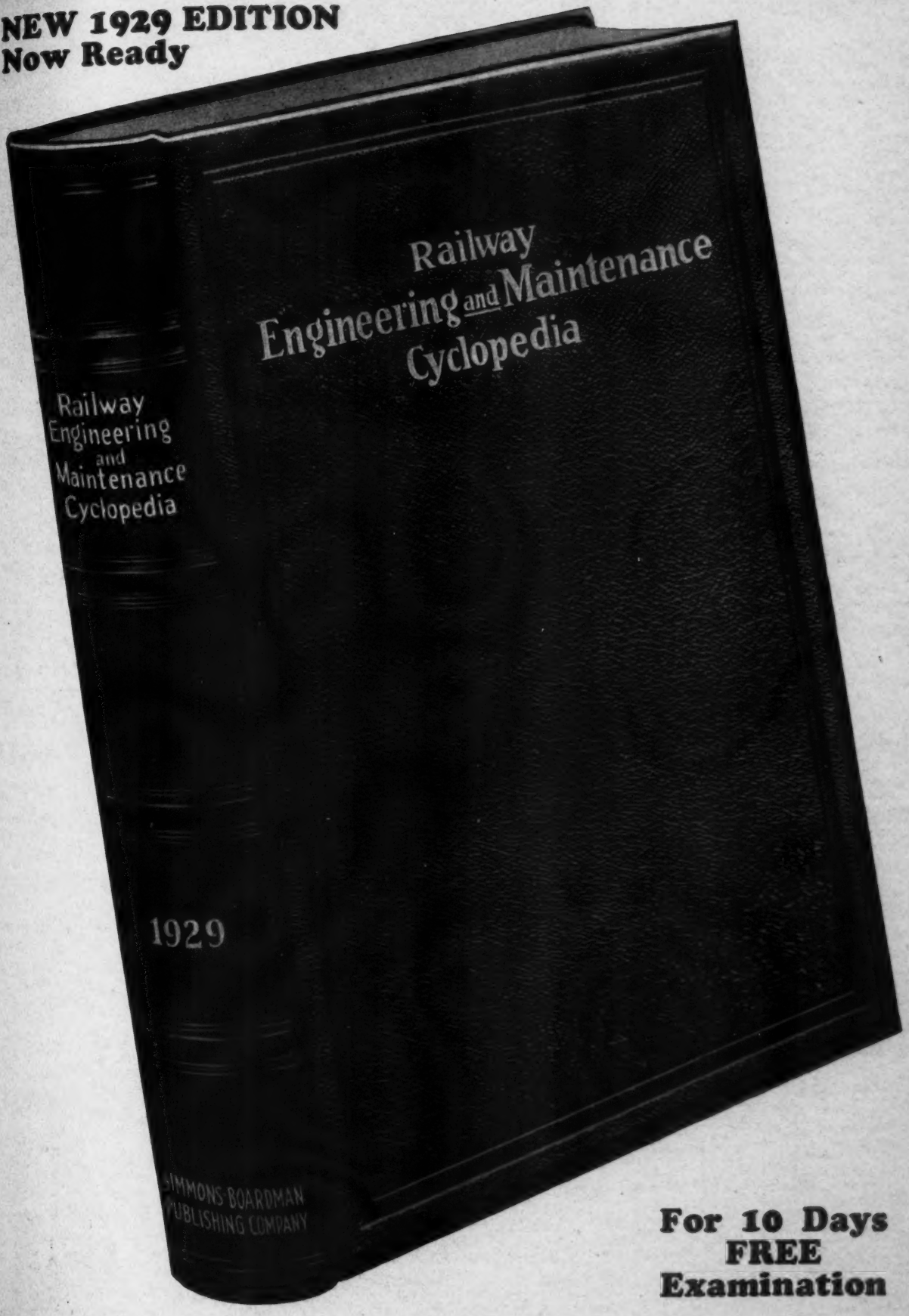
VERONA TOOL WORKS

1800 First National Bank Bldg. Pittsburgh, Pa.

NEW 1929 EDITION
Now Ready



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Engineering and Maintenance
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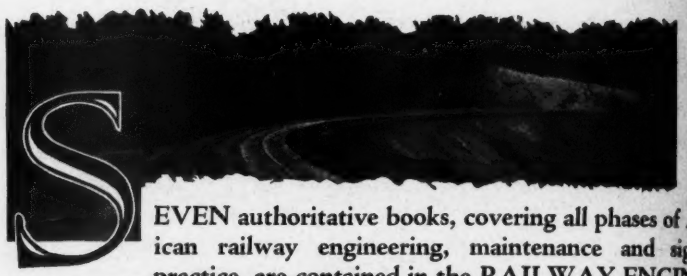

SEVEN authoritative books, covering all phases of American railway engineering, maintenance and signaling practice, are contained in the RAILWAY ENGINEERING AND MAINTENANCE CYCLOPEDIA.

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We will send you the Cyclop

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Who needs to know the uses and comparative value in relation to expenditures, of modern equipment and materials.

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Who has to keep in general touch with new developments in all branches of engineering and maintenance to insure the utilization of the most efficient methods by his road.

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This book is widely used by him as one volume library. He finds it t most useful of his few technical book

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He finds in the Cyclopedia a gr deal of information regarding tra building and signal standards wit he needs from time to time, in ad tion to a thoroughly up-to-date bo on modern materials, equipment a methods of bridge work.

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An Invaluable Compilation of Engineering Knowledge

Approved products, standard materials and accepted methods now in actual railway service are described collectively as to their general features. Detailed descriptions of design features and individual characteristics of equipment are presented in corresponding catalog pages by manufacturers. The latest accepted rules, adopted specifications, preferred practices and standard data of the A.R.E.A., the Signal Section of the A.R.A., the A.W.P.A. and other railway engineering associations are presented in full. The text is thoroughly illustrated with photographs, drawings and valuable charts.

Of Practical Use to Railway Executives

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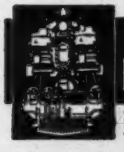

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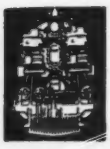

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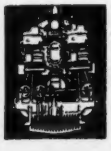

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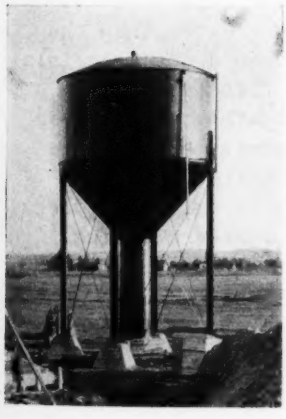

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June 27, 1929

Dear Reader:
Everywhere

I have already told you that our editorial staff is composed of men who have served their apprenticeship in practical railway service. Last month I told you of the more than one hundred and twenty railway men who annually supplement the work of our editors by contributing of their experience. I now want to tell you of another phase of our service in collecting information for you.

It is not many years since the editor's office was the source of most of the information published in the columns of his paper. It is still so regarded on some papers today. We have long felt, however, that the work of building and maintaining railway tracks and structures is primarily a field problem and that it is here and here only that one can see how this work is being done and can observe new methods. We believe that it is here only that one can get that intimate touch with practical problems that is so essential to their correct interpretation.

For this reason, our editorial staff is a traveling organization. The extent of its travels is shown by the fact that our editors and those of our parent publication, the Railway Age, travel a distance greater than the circumference of the globe every month, gathering information about materials and methods that we believe will be of help to you. As an illustration, I am writing this letter in Mexico City, while on a trip that will take me over more than 2,500 miles of important railway lines of this country and then over the more important railways of the Pacific coast, a single trip of nearly 10,000 miles. There is nothing unusual about this - it is all in the day's work of every member of our editorial staff - continuously gleaning from the best practices of each road for the benefit of all.

This is a part of the service which we feel that it is our obligation to render to you who subscribe for our publication.

Yours sincerely,

Elmer T. Howson

ETH:LG

Editor

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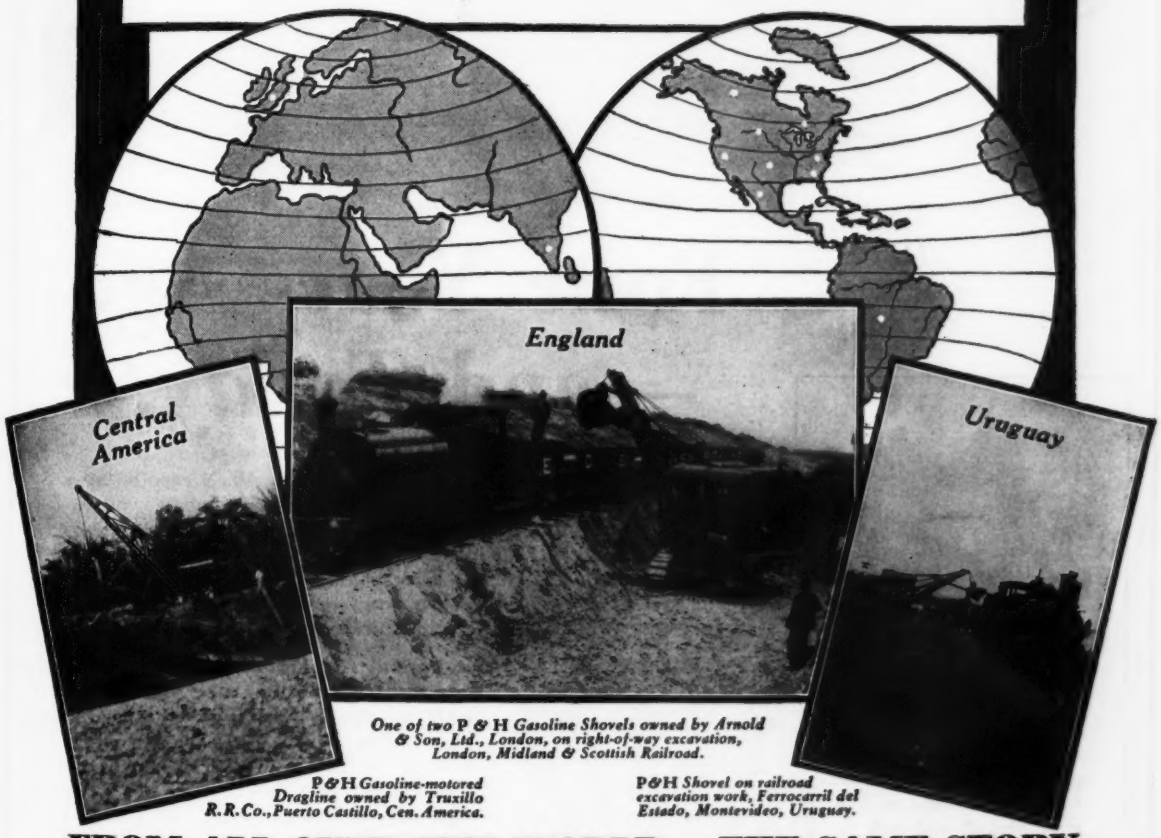
Bigger Yardage Fewer Repairs



One of two P & H Gasoline Shovels owned by Arnold & Son, Ltd., London, on right-of-way excavation, London, Midland & Scottish Railroad.

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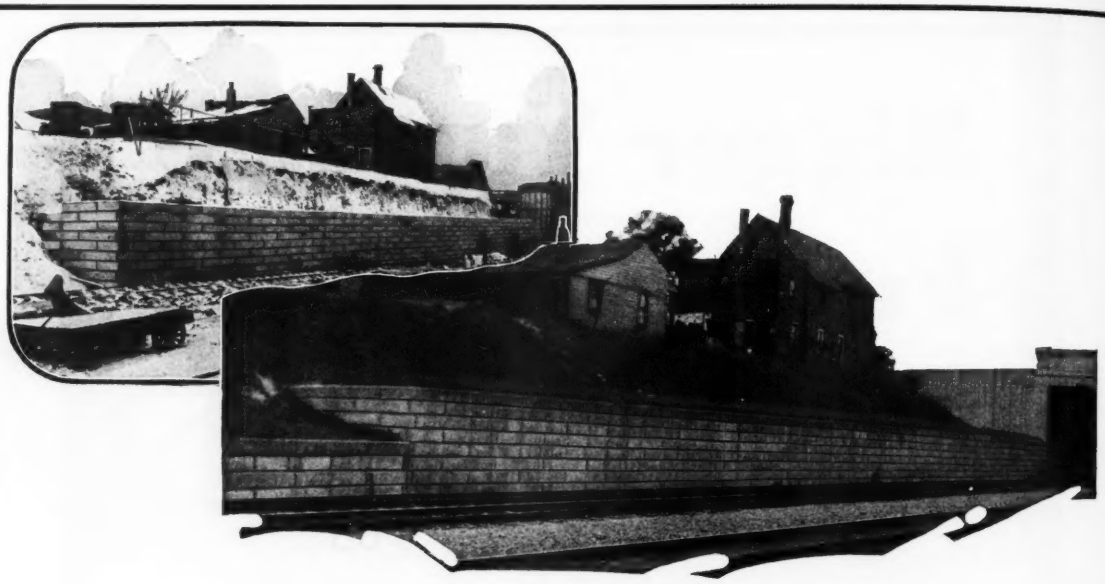

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Railway
Engineering and Maintenance

Volume 25 July, 1929 No. 7

The Use of Spike Mauls

WITH AN increasing refinement in track maintenance has come the realization that a rail, like a tie, may be seriously damaged through carelessness in the use of tools. Not all track men appreciate this fully, and for the purpose of focusing attention on one source of injury to rails, an editorial in the June issue, page 237, pointed to the injury which rails have suffered as a result of carelessness in the use of the spike maul.

By way of illustration, a case was cited of a rail that developed a cracked web following a spike-maul blow which it received during the application of a rail anchor. The only reason for using this example (which had just been brought to our notice) is that it was unusual, in fact the only one of its kind in so far as we know. However, the fact that its unusual character was not stressed has apparently resulted in a misunderstanding as to the purpose for which the editorial was written.

As stated by F. A. Preston, in a communication appearing on page 281 of this issue, the spike maul is provided primarily for driving spikes and is used a great many more times for that purpose than for setting rail anchors. Because of a failure to point out that the incident described was an unusual one and because no mention was made of the primary use of spike mauls in driving spikes, it could be presumed that the editorial implied a distinct doubt as to the wisdom of using a spike maul for applying anti-creepers to rails. No such implication was intended. The editorial was offered solely as a plea for greater care in the use of the spike maul in all its applications. And since this tool finds by far its greatest use in driving spikes and because half-moon breaks in rail flanges have in some instances been ascribed to misapplied blows of the maul in spiking, there is clearly a need for better training and more careful supervision of track men engaged in such work.

Watch the Fire Hazard

AT THIS season of the year when vegetation is the dryest and when timber is equally dry, track and bridge forces have a special responsibility to prevent loss from grass fires, both to railway structures and to adjacent private property. The mechanical department has done much to reduce the spark hazard by more careful maintenance of locomotives, but even with this improvement fires do start.

The problem of maintenance of way forces is so to protect the structures on or beside the right of way as to render harmless such grass fires as do start. In general, the measures to this end are simple and commonly understood. Yet, while losses from this source are steadily becoming less frequent, they still occur. Futhermore, since practically all right of way fire losses are preventable, each loss of this character reflects on the track foreman and the roadmaster on whose territory it occurs, for it usually results from some neglect of recognized precautions. Each of these men can now well afford to go over his line carefully to insure that all grass has been thoroughly scalped from around bridges and other structures of timber, that fire guards have been plowed along adjacent grain fields and that other reasonable precautions have been taken.

Higher officers can also analyze these losses by divisions and subdivisions to advantage to determine where the greatest attention is warranted. Since every fire loss represents an expenditure for which no corresponding benefit is secured, the elimination of these losses constitutes a direct addition to the net revenues of a road.

An Age of Refinement

RAILWAY men have been in the habit of thinking of a good section foreman or a good roadmaster as one who could do wonders with little—who, no matter how small the labor allowance or how restricted the allotment of material, would manage somehow to keep the track in a passable condition. In other words, he was an adept at makeshifts.

Times have changed. While the very magnitude of their operations is such that all expenditures must be scrutinized carefully to prevent leaks or waste, the railways have changed their attitude toward the requirements of physical upkeep and standards of practice. Whereas, the rule was once invariably—"What has to be done," we now find that "What ought to be done" has greater influence.

The magnitude of this difference between the policy of today and that of a quarter century ago is illustrated by the distinction between a treated tie, pre-bored and adzed and adequately plated, and an untreated tie inserted fresh from the woods without a tie plate. The preframing of trestle timbers before treatment, the remote-control pumping plant, treated tie plugs, heat-treated bolts, are all refinements that represent an appreciation on the part of railway managements of the merits of measures that cost more than the cheapest expedient.

This tendency pervades the entire field. Railway men of all ranks have come to realize that the original outlay is not the only consideration and that a more expensive way out may be cheaper in the end. They know that the purchase of a better bolt, or a

better tool can be justified because it will do better work and will last longer than one that may be had for less money. Buying to last is closely akin to building to last and both have a profound influence on maintenance.

Cost Analysis That Pays

RAILWAY maintenance officers who are endeavoring to find methods of reducing the large labor costs in connection with their work will be interested in the report on the cost analysis work on the C. & O. for 1928, included elsewhere in this issue. This report shows that as a result of this work, the C. & O. effected a definite net saving of $651,809 in maintenance expenses during the year. This should be of particular interest to those maintenance officers who may have looked lightly on the value of cost-analysis work, and who yet may have been congratulating themselves on practices or methods which show far less economy. The records of the C. & O. for the last three years, during which time it has had its unit-cost system in force, show net savings of $1,001,356 in the cost of conducting its maintenance work, which have been brought about by the increase in the efficiency of its maintenance forces from 80.5 per cent in 1926, to 83.4 per cent in 1927, and to 87.9 per cent in 1928. All of these figures can be subtantiated by data on the C. & O. obtained from sources entirely independent of the unit-cost system. Those who do not like figures in dollars and cents may consider the fact that there were 104,563 less man-hours employed by the maintenance department on 25 supervisor's districts in 1928, than on 22 of these districts in 1927. That this reduction in man-hours was not effected at the expense of the property is indicated by the fact that, as a result of the annual roadway inspection on the C. & O. for 1928, the tracks were given a rating three per cent higher than in 1927. These records of the C. & O. offer a challenge to maintenance officers of other roads who may take little stock in cost-analysis work.

Work Train Reduction Pays

WITH the maintenance of way programs for the year now well under way on the roads of the country, involving heavy work which will extend throughout the summer and fall months, maintenance officers can well afford to consider their practice with respect to the use of work trains in order to keep this large item of maintenance expense to a minimum. For years the work train was considered an indispensable auxiliary for a wide range of maintenance operations, and owing to the absence of other means for transporting heavy supplies, materials and equipment the extensive use of work trains was justified.

During the last few years, however, the situation has changed greatly, and maintenance men are finding that by the more extensive and effective use of the equipment now being furnished to them they can materially reduce the large part of their maintenance appropriations which has been going into work train expense. Unfortunately, however, there are still those who order or approve the use of work trains without giving proper thought as to whether other and more economical means of performing the work can be found.

Some roads have inaugurated crusades against the work train, recognizing, however, that there is still need for this class of service in certain instances; and these roads report large savings in their maintenance expenditures as a result. A recent report of one of the large eastern roads shows a most creditable record in this respect. This road reduced the number of work trains employed in maintenance work from 12,194 in 1926 to 10,158 in 1927, and further to 8,899 in 1928, which resulted in a saving of $84,595 in 1927 and of $156,232 in 1928 over the cost of work train service in 1926. These savings have been due primarily to the greater interest which has been taken in the subject during the last two years; the more careful planning of the shipment and distribution of materials; the more extensive use of motor cars and motor trucks for line distribution; the freer use of local freight trains for handling maintenance materials; and the use of ditchers and cranes in multiple, where possible, in carrying out maintenance operations.

As might be expected with such a reduction in work trains, there has been a tendency to use each train for a longer period of time, but that this has had slight effect upon the cost of each train, once it is out on the road, is seen by the fact that the average cost of each work train on this road during 1928, which includes engine and train crew wages, fuel costs, engine house expenses, and the cost of oil, waste and other supplies, was $53.58 as compared with $51.91 for each train in 1926, an increase of only $1.67 per train. It is also clear that the curtailment of 3,295 work trains on this road in 1928 from the number used in 1926 has had no appreciable effect in increasing other items of maintenance expense, because records of the unit costs of carrying out maintenance work on this road show a substantial reduction in these unit costs during the last two years. Enviable records in economy through the elimination of work trains are by no means confined to this road alone. In fact, there are other roads which can point to even greater savings in this respect. It is generally recognized, however, that there is still much room for further improvement.

Make the Foreman's House a Home

TAKING the country as a whole, it is not the practice for the railways to provide dwellings for their foremen. Yet on nearly every road there are some points where conditions are such as to require such facilities and on some roads it is necessary to provide them at many or most points. These quarters are therefore of some concern to practically every road. For this reason we present, on page 282, a survey of the practices of a number of leading roads with respect to the providing of dwellings for section foremen.

In studying this subject, one is confronted with a marked contrast in attitude on the part of railway managements. On the one hand is the road which considers such facilities as a necessary burden and gives no thought whatever to the fact that to the foreman, the house which the company provides is, of necessity, all that he can call his home. Other roads, however, are coming to appreciate the possibilities of such facilities as a means of building up employee loyalty and interest, and reducing turnover. It is to these roads that we have given the most attention in the article referred to, for we believe that they are capitalizing most largely on an expenditure that is necessary under any circumstances.

If the idealist could have his way, every section headquarters would be located in a community of such size that a foreman could find a home for himself, with good schools and social advantages. In

practical railroading, however, it becomes necessary to provide many section headquarters at points where such privileges are absent. If a road is to hold men of the proper type at such places, it must reduce the effect of these shortcomings by providing other attractions. The house can be made such an attraction. To this end, several roads have redesigned their plans for section foremen's dwellings in recent months to improve their arrangement and to provide for the installation of bathroom and toilet fixtures and other modern conveniences.

Several roads are achieving outstanding success in stimulating the interest of the foremen and their families in the better maintenance of the homes already built and in the improvement of their surroundings. On one road on which the management inaugurated such a campaign, the promptness with which the foremen removed their piles of stove wood to the rear of their houses, repaired their fences and otherwise tidied up their places was surprising. On another road many of the foremen's dwellings now compare favorably with the best in the villages and in at least one instance, such a home was awarded the first prize in a community home-improvement contest. Of even greater interest than this, however, is the fact that a foreman who makes an investment of his own time in a place such as this is less willing to leave it for another location. This is even more true of his wife who, after becoming interested in the cultivation of flowers and the improvement of the home, becomes attached to it.

Better Insulation of Buildings

BECAUSE of the great variations in climatic and other physical conditions which confront our readers throughout the length and breadth of North America we sometimes find that in serving the railway men in one section, we are compelled to publish material that may be of little direct value to those in other sections. At first thought, this might seem to be the case with the article on the insulation of buildings appearing on page 305 of this issue. This article deals with the practices followed in a territory where very low temperatures prevail during a long winter, but there is reason to believe that this subject of better insulation for buildings is applicable to a much broader field than the one to which the practices here described are confined.

The marked improvement in the insulation of buildings that has taken place in recent years has been brought about by two primary influences. It has been effected in part by the general campaign for greater economy in the use of fuel, for, as stated in this article, the results of improved insulation of buildings has been reflected in fuel saving. But of much greater influence has been the marked development in new insulating materials that has taken place in recent years, supplemented by the demonstrated value of such materials as the result of laboratory tests and actual use.

Such materials have naturally had their greatest application to buildings in territories where they were most sorely needed to insure comfort to the occupants and to save fuel, but they are now receiving recognition in regions of milder climate where the apparent need is not so great, because of the demonstrated economies to result from their use. It is well to remember, also, that insulation has a secondary value in that it works both ways. While installed primarily to "keep out the cold" in winter, it will also "keep out the heat" in summer.

What Our Readers Think

Avoid Damage to Rails

Chicago.

TO THE EDITOR:

I believe that most officers in charge of track maintenance are agreed that it is possible to injure a rail by striking the web or base with a spike maul. There is probably less agreement as to the frequency with which rails have been broken as the result of mishandling this tool, but no one will take exception to the warning to "Avoid Damage to Rails" presented in the editorial appearing on page 237 of the *Railway Engineering and Maintenance* for June, in so far as it concerns carelessness or clumsiness in the handling of the spike maul. On the other hand, I feel that to single out, as an example of such careless workmanship, a case in which a rail was injured during the application of a rail anchor is decidedly misleading, if not definitely unwarranted.

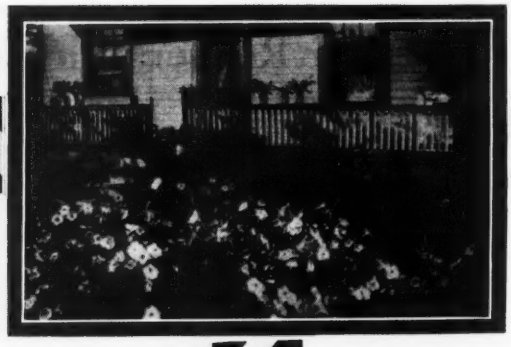
While the case you cite is within the bounds of reason, it must be classified as most remote. Why, therefore, do you select as your text for a sermon on poor wielding of a spike maul, a case that involves what is generally accepted as a secondary use of that tool, and cite an example which so rarely happens? As the name indicates, a spike maul is provided primarily for driving and redriving cut track spikes, and for this purpose it is used many times as often as it is used in applying rail anchors, and as a matter of fact in the broad experience which the writer has had in the sale and use of rail anchors covering a period of twenty-three years, I have never heard of a previous incident where a rail failed due to the misuse of a spike maul in applying rail anchors.

While I am sure the only object of your editorial was to admonish track men to exercise care in the use of the maul, the fact that it referred only to its use in applying rail anchors, may easily lead to two inferences, (1) that there is more danger in hitting the rail in this particular use and (2) that it would be better not to use anchors that must be applied with the maul. With the first inference, no practical track man can agree, because it would be almost impossible for a trackman to wield the spike maul so carelessly that in an attempt to strike the anchor at the edge of the rail, he would accidentally strike the web several inches away. As to the second, it would be just as logical to contend that the railroads should abandon the use of cut spikes, as to infer that they should discontinue to use rail anchors that must be applied with the same tool, particularly when we know from experience of the remoteness of the liability of these accidents.

It seems to me that your editorial "Avoid Damage to Rails" is a most inadequate treatment of this subject, and with further study you would find out that instances where carelessness in using spike mauls has caused damage to rails are practically nil.

F. A. PRESTON.
Vice-president, P. & M. Company.

FREIGHT SERVICE EXPEDITED.—The New York Central has established a new fast freight service for fruits and vegetables from Chicago and St. Louis, providing tenth morning delivery of perishable freight from the Pacific coast at both New York and Boston.



A Home for t

or Just a p

While the tendency is to provide more attention is being li

ON THE railways which formed the advance guard of the civilization that followed on the heels of the hardy pioneers in the vast Western regions of the United States and Canada, it was necessary, in most cases, to build living quarters for the foremen as well as for the laborers in the section gangs, since few houses were available for rent, especially in the smaller towns, and the ability of the foreman to finance the construction of a home was limited, even when he had the desire to do so.

In keeping with the primitive communities in which they were built, these houses were usually crude affairs architecturally, designed rather as shelters than as homes, and were constructed on the right of way or station grounds, both to avoid the purchase of additional property and to have the foreman and men within easy reach of the track in cases of emergency. With the growth of the country, the necessity for providing these houses passed in all but certain regions, until, at present, most roads furnish them only in places where living accomodations cannot be secured by the men at a reasonable outlay for rent or purchase.

Information Supplied by the Railways

To ascertain the practices of the various roads in this respect, a questionnaire was submitted to the railways asking for information as to their policy in regard to dwellings for section foremen and dwellings or bunkhouses for the laborers.

At the outset, it may be said that there are two lines of thought as to the policy of providing living quarters for maintenance of way employees, especially foremen. These thoughts are variously expressed and the following, in which it will be noted that local conditions have their weight, may be taken as representative.

I. H. Schram, engineer maintenance of way of the Eastern district of the Erie, views the question as follows:

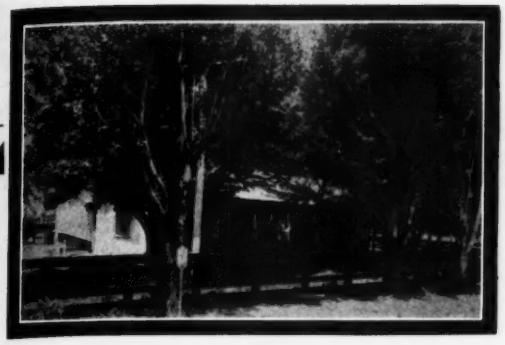
"The labor situation on the Erie in general is similar to that of other railroads in the Eastern section of the country where the population is large enough to provide sufficient local labor to keep the regular section forces supplied. This is the most desirable condition, as men living in the town where the section headquarters are established are an asset to the community and the railroad. Their pay brings a supply of ready money into the town, which is appreciated by the merchants, while their presence protects the labor problem of the section, which is the backbone of the railroad maintenance organization. We therefore encourage the local labor and employ such men wherever possible.

"Similarly, the section foreman, residing in his own home in his own town, is a more valuable and efficient employee than one living in a company house on the right of way. He is usually a respected citizen of the community and is often one of the leaders in a small town. He owns his own home in most cases, and educates his children well. Many of the houses provided for foremen in former years, therefore, have stood vacant and were finally removed as unnecessary."

The Kansas City Southern traverses a country essentially different in population from that in which the Erie is located and its problem accordingly takes

As One Chief Engineer Sees It

"We have been working on a program to get away from the old conventional box style in the construction of homes for section foremen, and attractive designs have been used in recent years. * * * While the results have been to the advantage of the company, its policy in this regard has been dictated by a sincere and honest interest in the personal welfare of its employees and the wish to make their homes attractive and desirable."



the Foreman

Place to Live

living quarters only where necessary, paid to make them comfortable

on a different aspect. How it is met on this road is described by A. N. Reece, chief engineer of the Kansas City Southern.

"A great deal has been done by the railways in the promotion of the welfare of their employees. One of the greatest factors in promoting the contentment of the employees and fostering a satisfactory relationship is the providing of adequate and attractive quarters.

"A necessity for permanent quarters for certain classes of employees exists in many localities. For instance, in the sparsely-settled regions, living quarters cannot be found and, in the treatment of this problem, the railway must consider its convenience and the accessibility of employees in time of emergency.

"Permanent living quarters are provided for employees, together with their families, who are in charge of section work and pumping stations. It is the rule to furnish section foremen with living quarters and it is only in exceptional cases where such quarters are not established. No actual charge is made for rent, but a differential of $10 per month in pay is made between sections where houses are furnished and where the foreman provides his own.

"We have been working on a program to get away from the old conventional box style in the construction of homes for section foremen, and two attractive designs have been used in recent years, one of which will probably be followed in the future. This work has led to a spirit of contentment and personal satisfaction on the part of the foremen, whom we consider an arm of the supervisory forces of the railway. There is less moving around between sections, as well as a marked decrease in the changing of foremen on account of their being dissatisfied with their conditions, and this has been reflected in the efficiency of the work, by reason of a more stabilized working force and a greater interest by the men through their appreciation of improved living conditions. While the results have been to the advantage of the company, its policy in this regard has been dictated by a sincere and honest interest in the personal welfare of its employees and the wish to make their homes attractive and desirable."

Housing Situation in the Northwest

Still another phase is illustrated in the experience of the Northern Pacific and the Great Northern, whose lines, when built, traversed sparsely-settled regions which have since become well-settled and prosperous. The bearing of this change on the housing of track forces is explained by Bernard Blum, chief engineer of the Northern Pacific, as follows:

"The problem of obtaining and holding labor for railway maintenance of way work and providing housing facilities on the lines of the Northern Pacific has changed considerably since the war.

"During the so-called early days in the Northwest, it was just as necessary for a road to provide living quarters for its employees as it was to construct facilities for the handling of its business. Until recent years, it was usually necessary to import laborers for whom living quarters had to be furnished. This led to the construction of large section dwellings in which laborers could be housed and boarded, as well as to provide a home for the foreman and his family. Following the influx of foreign labor, it seemed desirable to separate the quarters for the foreman and the laborers, and bunk houses were provided for the latter. Frequently these consisted of dismounted box-car bodies, and in other cases portable bunk houses were used.

Foremen Now Able to Secure Own Homes

"With the increase in wages following the war, which placed the railways on a par with other employers in attracting a better class of labor, we have been able to

Examples of Some Real Homes

The six views shown above are typical examples of what can be done to make a section house more than "just a place to live." Beginning with the view at the lower left their locations are as follows: Texas & Pacific at Addis, La.; Kansas City Southern at Bunch, Okla.; Missouri-Kansas-Texas at Wagoner, Okla.; same road at Blue Jacket, Okla.; Kansas City Southern at Gentry, Ark.; Chicago, Rock Island & Pacific at Anadarko, Okla.

draw largely on the citizens and residents living adjacent to the stations on the lines. In a number of cases foremen own their homes, leaving the section houses vacant. In the larger cities and towns, where houses are available for rent, we have given up the practice of providing houses for section foremen, for the reason that they are paid wages comparable with those of other employees for whom living quarters are not furnished; therefore, no new section houses are being erected except at isolated locations. With the employment of natives, the demand for bunk houses has decreased greatly and we have, in fact, removed many such buildings. The advantage of such a condition seemed obvious and, to some extent, offsets the higher wages paid, when the saving made by not providing and maintaining living quarters is taken into consideration.

"Where houses are provided for maintenance men, no rent is charged nor is the use of such houses regarded as part of their compensation, as they receive the same wage as their fellow foremen who are not provided with houses. In general, the houses are built to standard plans, either a bungalow type of cottage or a 1½-story simple frame house with concrete foundation and basement. Where the size of the foremen's families demands, special provisions are made to take care of their needs. In recent years, these houses have been connected to city water mains and to sanitary drainage systems where they are available. Where no municipal water system exists, deep wells are drilled to insure an adequate supply of pure water.

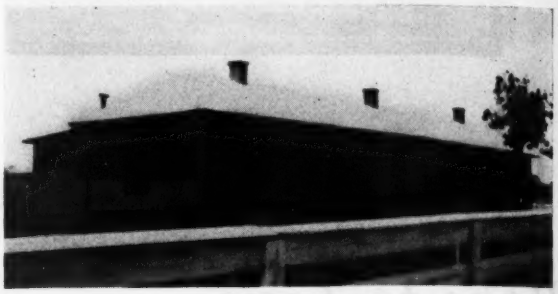
"A large number of our foremen are descended from the Nordic races and the problem of the proper maintenance and care of the homes is not serious. It is difficult to measure definitely the advantages accruing to the railway through such expenditures, but we are satisfied that it is only through such means that we can attract and hold good men; there are, undoubtedly, tangible results in having the good-will of the employees."

Housing Problem in the Northwest

The Great Northern, like the Northern Pacific, was faced with the necessity of supplying living quarters for the foremen and laborers in the maintenance forces, but, in contrast to the latter road, it still furnishes such facilities for all of its foremen except in some of the larger cities. G. G. Smart, formerly general roadmaster and now superintendent of work equipment, advises that the demand for bunk houses is decreasing, as in many localities native labor is available. A marked change has taken place in the class of labor on the track in the last eight years on the Great Northern; the percentage of foreign or floating labor on the sections is growing smaller each year, and it is only in the sparsely-settled portions that foreign labor is now employed.

The Atchison, Topeka & Santa Fe and the Southern Pacific, whose lines traverse considerable areas of desert and other thinly-populated districts, are confronted with the housing problem to a greater extent than any of the other railways of the country. Each of these roads has devoted much attention to this subject and their practices will be described in a future article.

While the housing problem is greatest on the Western roads, it is by no means confined to them, but is found to some extent in many of the oldest states in the Union. Thus, in New England, the Bangor & Aroostook finds it necessary to provide accommodations for both its foremen and laborers at certain outlying stations, but prefers that they obtain their living quarters in the villages where they live when it is possible to do so. Similarly, on the Boston & Maine, these facilities are furnished at remote points only, and W. J. Backes, chief engineer, advises that this necessity is decreasing owing to the extensive use of motor cars on the sections. The Maine Central also provides permanent living quarters for its maintenance employees in inaccessible places only, as in the White Mountains and the northern part of Maine which are not served by highways and where no other accommodations are available. At such places convenient, attractive houses are built.



Section Laborers' Barracks at Millsap, Texas, Texas & Pacific

In like manner, the New York Central and the Delaware & Hudson provide houses for their foremen at outlying points where these facilities cannot be rented. On the New York Central they are usually built to standard plans, but some variations are made where the situation warrants a change to suit conditions at a particular location.

The Delaware & Hudson, in keeping with its broad policy of improving its housing facilities, has designed section foremen's dwellings which are unusually complete in the various details for comfort and convenience. They are of frame construction, with concrete foundations and with a cellar extending under the entire area of the floor. They are provided with running water, lighted by electricity, heated by hot water and equipped with electric fans, while the wastes from the sinks and bath-room are disposed of through a cesspool located at some distance from the house. Electric current for lighting and fans is generated by a farm-lighting unit, which also operates a small automatic pumping outfit for

An unusual type of building for an extra gang — on the Missouri-Kansas-Texas at Ray yard near Denison, Texas.

supplying water, which is obtained from deep wells when other sources of pure water are not available.

Many Southern Roads Build Houses

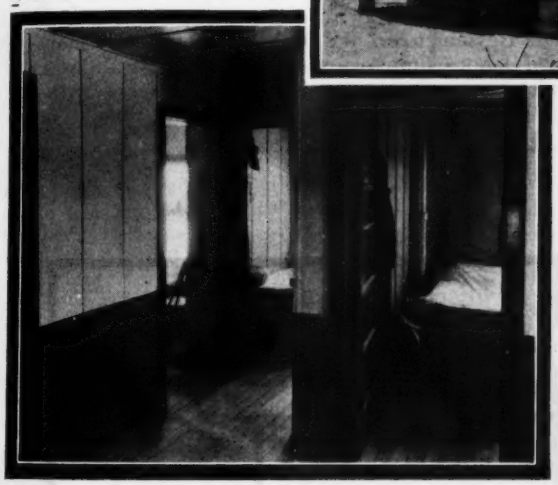
Many of the railways in the Southern states were also forced to provide living quarters for the section forces on account of the scanty population in the regions through which the roads were built. While this necessity has passed in many localities, there are still places at which it is necessary to keep up this practice. Thus, on the Central of Georgia, about 75 per cent of the sections are equipped with quarters for the foremen as well as for the laborers. The Louisville & Nashville furnishes houses for all of its section foremen, with separate quarters for the laborers, who are largely colored, especially on the southern portion of the system. The houses are

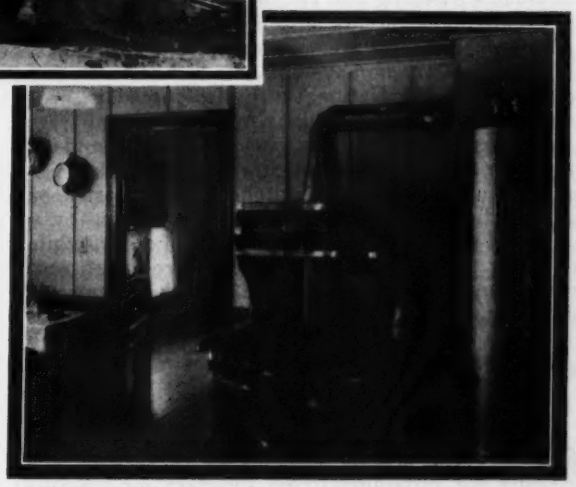
The roads in Arkansas, Louisiana, Oklahoma and Texas also find it necessary to provide living quarters for their section forces. Among these are the Kansas City Southern, the Chicago, Rock Island & Pacific, the Missouri-Kansas-Texas, the Missouri Pacific and the Texas & Pacific. On the Kansas City Southern, whose policy in this respect has been outlined, one of the latest designs, which will probably be adopted as standard, provides a five-room dwelling with a living room, dining room, kitchen, two bedrooms and a bath-room, together with a screened sleeping porch. The building is of frame construction, with concrete foundations and a concrete floored basement, 24 ft. long by 11 ft. wide. Provision is made for electric lights.

The Rock Island, in common with other roads in the Southwest, has a number of old section houses,

The attitude of the section foreman's family toward a home like this is reflected in character of the housekeeping.

The interior views in this Delaware & Hudson house will be readily identified by reference to the floor plan on page 287.





built to standard plans, one plan being used on the northern divisions and another for those on the southern divisions.

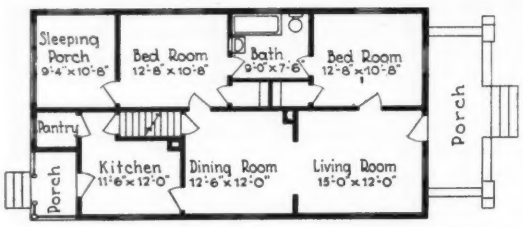
The Nashville, Chattanooga & St. Louis also provides dwellings for its foremen and laborers. The houses for the laborers are double, being divided by a longitudinal partition to form two dwellings of two rooms each. The same ground plan is used for the foremen's houses, the partitions, doors and windows being changed to provide a four-room house. The buildings are of frame construction, with a stucco finish which conforms to the standard color, and the only painting necessary is for the trim and interior walls.

The Mobile & Ohio is another Southern road which has equipped all but a few of its sections with houses for the foremen, together with three laborers' houses at each location. The houses are of frame construction, set on brick piers and footings, and bath-rooms are provided in certain locations.

but these are kept in good repair and well painted. The standard plan at present provides a four-room dwelling with a living room, two bedrooms, a kitchen and front and rear porches. The houses are painted in standard colors, with a colonial-yellow body, white trim and dark-green skirting. The fence around the yard is of woven wire and the posts are set eight feet apart, with a 1-in. by 6-in. board on top, sloping away from the yard. All wood-work on the fence is painted white.

Special Dining Rooms on D. & R. G. W.

In the West, the Denver & Rio Grande Western builds section quarters at all points, these consisting of a five-room house for the foreman and his family with one or more bunkhouses, each 16 ft. by 20 ft., equipped with four double-deck bunks, for the section laborers. On this road the foremen boards the trackmen who occupy the bunkhouses and to permit this the dining room is large, 22 ft. long by 12 ft. wide. Both types of buildings are of frame con-



New Plan for Foreman's Dwelling on K. C. S.

struction on concrete foundations, and the foreman's house has a cellar, 18 ft. by 10 ft. wide, under the kitchen.

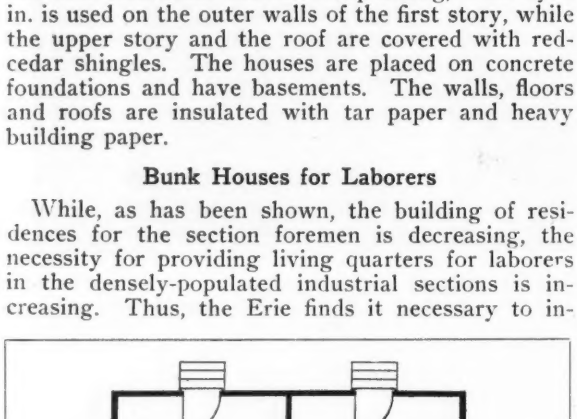
The Missouri-Kansas-Texas builds neat, attractive four-room houses for its foremen where satisfactory living quarters cannot be obtained otherwise, and, where it can be done at a reasonable cost, provides water, gas and electric light. In some cases, bathrooms are installed also. The foundations are of concrete and a cellar with a concrete floor is provided. The inner walls and ceilings are plastered in Missouri, Arkansas and Northern Oklahoma, while in Southern Oklahoma and in Texas they are ceiled with yellow pine. The standard layout consists of a foreman's dwelling and two bunk houses for laborers, occupying a plot of ground 200 ft. long by 75 ft. deep, enclosed by a board fence.

The major Canadian systems, the Canadian Pacific and the Canadian National, are also forced to provide accommodations for their foremen and laborers at outlying points. On the latter road the standard plan is for a seven-room two-story house, with a living room, dining room and kitchen on the first floor and four bedrooms above. Drop siding, 1 in. by 6 in. is used on the outer walls of the first story, while the upper story and the roof are covered with red-cedar shingles. The houses are placed on concrete foundations and have basements. The walls, floors and roofs are insulated with tar paper and heavy building paper.

Bunk Houses for Laborers

While, as has been shown, the building of residences for the section foremen is decreasing, the necessity for providing living quarters for laborers in the densely-populated industrial sections is increasing. Thus, the Erie finds it necessary to install these facilities in cities and large terminals where there is often a shortage of track labor. In such locations permanent buildings are erected, generally of frame construction, and sanitary regulations are enforced. The buildings are plastered inside, lighted by electricity and heated by steam. Sanitary toilets, shower baths and wash-stands are provided and the sleeping quarters are partitioned off into separate rooms, each containing steel bunks for from 8 to 12 men. The Hocking Valley also installs shower baths in its permanent camps and divides the sleeping space into rooms which are equipped with steel bunks.

On the Lehigh Valley, the camp situation is very similar to that on the Elgin, Joliet & Eastern, which was described in the March, 1928, issue of *Railway Engineering and Maintenance*.

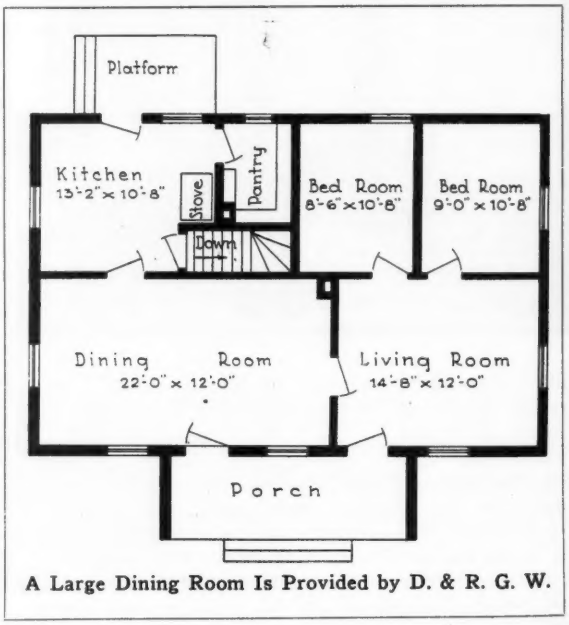


Plan of Laborers' Quarters on N. C. & St. L.

Permanent Camps on New York Central

On the New York Central, permanent camps have been built to take the place of temporary camps and the facilities have been improved. At all of the large camps separate buildings are provided for toilet facilities and for wash-rooms and shower baths. The mess hall is used in the evening as a lounge or game room and two camps near New York City have radio outfits. At one camp, in addition, a coach is set aside as a reading room. Special attention is given to sanitation at all of the camps.

The Bessemer & Lake Erie, which formerly maintained labor camps, now has no such facilities in service, since it has a sufficient supply of native labor to take care of its needs. This road, some years ago, discarded the ordinary tar-paper bunk houses and erected in their places neat buildings covered with weather boarding and lined inside with Beaver board.



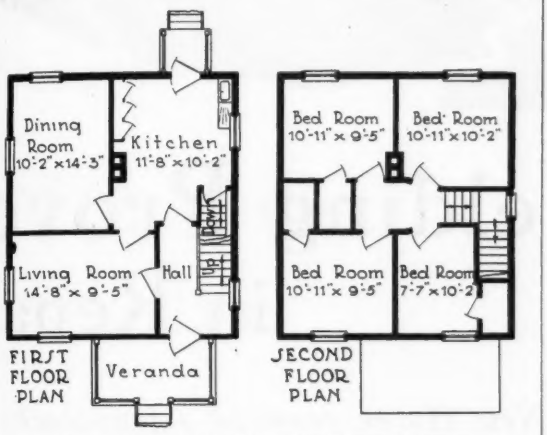
A Large Dining Room Is Provided by D. & R. G. W.

The Canadian Pacific and the Canadian National also provide bunk houses for the laborers at outlying points. On the latter road, where forces are maintained during the winter, bunk houses are preferred to outfit cars since they can be heated more satisfactorily and economically. At certain locations,

the Canadian National uses portable bunk houses, 32 ft. long by 9 ft. 4 in. wide, and a width of 12 ft. at overhang of eaves. These are divided in three sections, the end sections 11 ft. long, with a center section 10 ft. long, for ease in handling when they are being moved. Each bunk house is equipped with four standard double bunks, lockers, a table and two cupboards.

Improving the Surroundings

The practice as to charging rent for houses furnished by the railway varies with the different roads. Some furnish them free, while most of them charge rent, ranging from nominal payments of a few dollars a month to a rental based on the cost of the house. Regardless of the rental charge, those roads

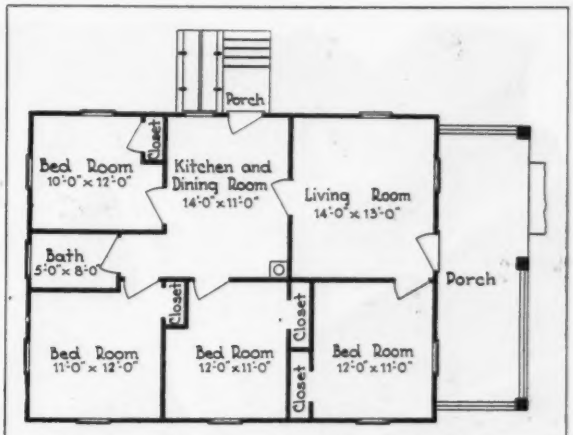


Canadian National Builds Two-Story Houses at Outlying Points

which have been foremost in the improvements in these facilities assist the foreman in improving the surroundings of the houses by furnishing trees, shrubs or flowers, and encourage the occupants to take a pride in the work. On the Atlantic Coast Line, a prize is given for the most attractive quarters, while the Missouri Pacific awards two prizes annually: one to the foreman making the greatest improvement in the general condition of his home and surroundings and another to the foreman whose quarters and grounds are in the best condition, regardless of the improvement during the year. This road co-operates with the foremen by furnishing fruit trees, nut trees and shrubbery with which to beautify their yards. A. A. Miller, engineer maintenance of way, advises that these efforts have been productive of much good and finds that when the house conditions improve other conditions improve also, with the result that the foreman is better satisfied, while his family is more contented in having a home rather than just a place to live.

Central of Georgia Plants Trees

The Central of Georgia likewise encourages the cultivation of flowers and furnishes seed for that purpose. It also sets out pecan trees in the yards surrounding the foremen's dwellings, both to improve the appearance of the grounds and to furnish nuts, which are appreciated by the foreman and his family. Trees which were planted many years ago have now reached a size which give ample shade. In nearly all cases, there is sufficient ground in the



The D. & H. Plans Provide Plenty of Closet Space

rear of the houses to provide space for a vegetable garden which is made use of to the advantage of the foreman and his family. According to C. E. Weaver, chief engineer, these measures have been helpful in promoting a contented feeling among the employees, since the gain to them is not only financial, but enables them to live more comfortably than would otherwise be possible and this is reflected in greater loyalty and effort on their part.

On the Chicago, Burlington & Quincy, where foremen's dwellings are provided to a large extent on the lines west of the Missouri river, H. R. Clarke, general inspector of permanent way, states that considerable improvement has been made in the last few years in the premises around the houses. This has been done in many cases by the removal of makeshift shanties and the construction of neat sheds made of second-hand lumber to replace them. At locations favorable for the growing of grass and shrubs, either under natural climatic conditions or by sprinkling, this is encouraged by furnishing grass seed and by paying the water rates if a supply is not available from the railway's facilities, with the result that the foremen take a pride in their homes.

On the Rock Island lines in the Southwest, F. T. Beckett, district engineer maintenance of way, advises that the railway encourages the planting of fruit trees and berries, the making of gardens and the raising of poultry by the foremen and that these efforts have met with such hearty co-operation on the part of the men that the labor turnover is small and there are very few cases subject to criticism.

The Oregon Short Line also purchases trees and plants for planting around the houses which it provides for all roadmasters, section foremen and signal maintainers. The late F. D. Naumann, engineer maintenance of way of this road, notice of whose death was published in the February issue of *Railway Engineering and Maintenance*, in transmitting this information said that an interest in beautifying the homes and surroundings was stimulated by the encouragement of private initiative and that the results obtained had been well worthwhile. Similarly, R. H. Gaines, engineer maintenance of way of the Texas & Pacific, which also provides houses for all of its section foremen, testified to the value of stimulating pride in the occupants of these homes and said that it had resulted in their being contented, with an improvement in the general personnel and a reduction in the labor turnover.

In some cases it was necessary to work from a ladder—In the oval—a welder at work

Welding Proves in Repair

How the New Haven repaired a four-track plate girder structure successfully by this method

By A. W. SCHENKER
Chief Engineer, The Electric Welding Company of America, Brooklyn, N. Y.

THE New York, New Haven & Hartford recently adopted the arc-welding method in repairing one of its main-line bridges. In doing this work, about 10,000 lb. of steel were added to the structure and about 575 lin. ft. of welds were made. All of the work was done without interfering with traffic, although the various tracks of the bridge were out of service intermittently for a total of about 15 hours.

The bridge repaired is the four-track through plate girder bridge of the New Haven over the Boston Post road at Darien, Conn., which had developed cracks at the roots of a number of its top flange stringer angles, a type of failure which is not uncommon in old bridges of this type. In this bridge the stringers consist of four 4-in. by 3-in. by ⅜-in. flange, angles, and a ⅜-in. by 36-in. web plate. Because of the cracking of certain of the top flange angles the strength of the bridge had been reduced, and the object of the repair work was to restore the original strength of the defective members. This was accomplished by the welding up of the cracks which had developed, and by welding new cover plates over the tops of the stringers. Throughout the work, the welds were designed to develop a working stress of not to exceed 8,000 lb. per in. of fillet.

In the first detail of the work, the tops of all stringers between ties were thoroughly cleaned of all dirt, paint and other impurities, by means of an air hammer. The new cover plates, which were of copper-bearing steel, were then raised and placed on the lower flanges of the stringers, preparatory to lifting and placing them on the top flanges of the stringers. All of these new cover plates had been provided with one shop coat of paint, except at the edges to be welded.

When the cleaning work was completed, the panel of track resting on the stringers being strengthened was raised by jacking from the tops of the floor beams, and the new cover plate was then lifted to the proper level. This was done by means of a rope attached to the center of the plate, which extended up through the deck structure between the ties. When so raised, the plate was slid into position on top of the stringers and then centered and tack welded. The rails in the panel affected were then lowered, and the work proceeded to the next panel.

In actually carrying out the welding work,

C-clamps were applied at regular intervals to grip the new cover plates and the outstanding legs of the flange angles so as to insure tightness between the two contact surfaces. The edges were then welded between the ties from above, and the clamps removed. All of the cracks in the flange angles were also welded, but before this work was done, each crack was cut out into a "V" shape with an acetylene torch, and its surfaces cleaned thoroughly. The process, as described, was repeated for all four tracks of the bridge, except where previous strengthening work made slight alterations in the procedure necessary.

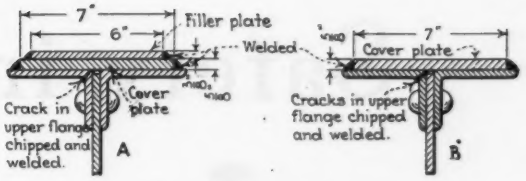
The bridge had been repaired for similar defects by the riveting method some eight years before. The method then used to restore the strength of the cracked angles was to rivet patch plates to the flanges locally over the cracks. In the new work, before the tracks were raised, all rivet heads holding the patch plates were burned away, so that, when the ties were raised, the rivets could be backed out and the patch plates removed. The application of the patch

Effective of Bridge

plates in the old strengthening work had necessitated the redapping of the ties wherever the plates occurred, and therefore, in the new work, in order to accommodate all of the ties that had been thus redapped, filler plates of a thickness and length equal to the old patch plates were welded to the new cover plates. After all welding was completed, all new steel and all welds were given a coat of red lead and linseed oil.

No Interference to Trains or Highway Vehicles

All of the work on the Boston Post Road bridge was done under flag protection, in 29 days, and no delay was occasioned to trains using the bridge. During the progress of the work, special precautions had to be taken to prevent interference with the heavy traffic on the roadway beneath, and to prevent sparks from falling on passing vehicles. Owing to the low clearance over the highway, all scaffolding was supported on the lower flanges of the stringers, and nothing was allowed to project below these flanges. In certain cases, however, it was found expedient to work from the top of a ladder.



Typical Sections Through Stringers

(A) Shows welded cover plate and filler plate to suit existing dapping of ties. (B) Shows welded cover plate without filler plate.

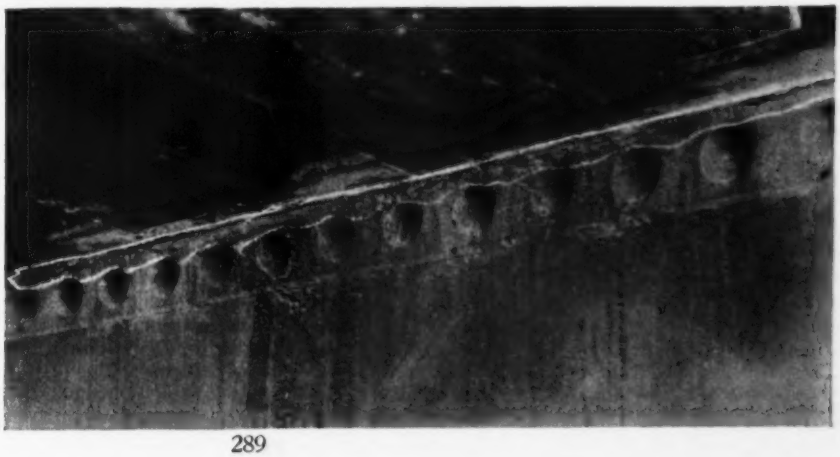
The source of the welding current used in the work was a gasoline-driven, double-generator unit, with sufficient capacity for the operation of two welders. This unit was mounted on a gasoline-driven truck, and was set off on the embankment adjacent to one end of the bridge. Air for the cleaning work, etc., was supplied by a compressor unit, direct-connected to the gasoline engine driving the generators. The current applied to the welding arcs averaged 200 amperes, and the electrode used in the work was $\frac{5}{16}$-in. Roebling wire of structural grade. Strain-gage readings taken before and after the cover plates were welded, with approximately the same loading conditions in each case, indicated that the live load stresses in the top flanges were cut in half.

Following is a list of the materials used, the labor employed and the amount of welding done in connection with the work:

Steel, lb.	10,020
Welding electrode, lb.	500
Oxygen, cu. ft.	2,200
Acetylene, cu. ft.	1,132
Total working days	29
Labor, welding, cutting, cleaning, handling materials, etc., man-hours	840
Track maintenance and general work, man-hours	240
Time that tracks were out of service to allow the placing and tack welding of cover plates, hours	15
Flagman, days	29
Inspection, hours	32
Welding (including cover and filler plate), lin. ft.	396
Flange-angle cracks welded, lin. ft.	177
Gasoline, gal.	330
Oil, gal.	2

Lumber for scaffolding, paint, meals and board, telephones, transportation, and other incidentals not included in the above, formed about 10 per cent of the total cost.

The repair work on the bridge at Darien was designed and carried out under the direction of Edward Gagel, chief engineer of the New Haven, and P. B. Spencer, engineer of structures, was in direct charge of the work. All track raising was done by railroad forces, and all welding and erecting was done by The Electric Welding Company of America, Brooklyn, N. Y.



A view showing a welded crack in the fillet of a top flange angle

Safety in Maintenance of Brought Up to

Reduction in accidents to employees requires special rules which must be enforced firmly

The Track Walker Must be Alert to Protect Himself

By G. H. WARFEL

Assistant to General Manager, Union Pacific, Omaha, Neb.

REGARDLESS of what else may be said about the effect of government war-time control upon American railways, it had one beneficial result of far-reaching consequence in that it brought officers and men of individual roads into much closer contact with other properties than their own. From the knowledge gained by such contact and the experience and demands of that period, there developed certain standard bases of comparison by which efficiency of operating methods might be judged. Much friendly rivalry was engendered which has grown steadily more intense, in the effort of each road to achieve more satisfactory results in these well-recognized lines of endeavor.

There is one standard for comparison which is looming more important each year in the minds of both railway executives and employees; the number of casualties to employees, passengers and the general public. Every railway man is vitally interested in the safety of each of these classes of persons, for frequently he may be in all three of them on the same date,—an employee while at work, a passenger riding on a train to or from his work, and an automobile driver on the highway in his leisure hours.

Maintenance men, however, are chiefly interested in their safety while at work, for they incur injuries while on duty at a rate higher than that of any other large group except trainmen. Of the latter, the men in freight and switching service constitute the only large class of employees who receive injuries oftener than bridge and building carpenters and track laborers. Much attention has been given the trainmen's safety in past years, for the hazards of their work are more spectacular and their injuries are more frequently severe. The injuries of maintenance men, on the other hand, are not so often fatal or permanently disabling and, until rather recently, there was not so much serious thought given to ways and means for preventing accidents among them.

The large majority of men in this department work chiefly with coarse materials and with heavy, cumbersome tools requiring much exertion. When we consider also the wide range of duties and almost countless jobs that these men are called upon to perform in all kinds of weather and in small detachments scattered along the road, we realize that their work presents the most difficult problem in railway accident-prevention work.

Four Principal Causes of Injuries

The gravest hazard to these men is the constant danger of being struck or run over by a train, either while riding on track cars or working about the track. This danger has been increased somewhat on the Mid-Western roads in recent years, owing to the growth of traffic, faster trains, less smoke, more trees and buildings to obscure the view and the extensive use of motor track cars. A second important source of injuries, not so frequently severe, is the handling of timbers, rails, ties and bulky material, much of which is done by hand. Probably third in consequence is the use of hand tools. Maintenance work, especially on single track lines, is of such a nature and is spread over so much territory as to prevent the economical use of power apparatus for any except the heaviest and the most concentrated jobs.

Another prominent factor in injuries to track and bridge men, as well as to men in all other classes, is falling caused by slipping or stumbling. This hazard is especially difficult to avoid, considering the conditions under which much of their work is done and the fact that they are moving about practically all the time they are at work. Men in the bridge and building department have the added dangers of materials and tools falling upon them from overhead, scaffolds or planking turning or giving way, and of losing their balance while climbing about structures.

*Abstracted from a paper read before the Steam Railroad Section of the Rocky Mountain Regional Safety Conference at Denver, Colo., on January 11.

# of Way Work to Date

Trailers for Carrying Men Should Have Raised Seats

There are four principal features which must be provided for in any effective campaign for reducing the frequency and severity of accidents in the maintenance department, as follows: An adequate supply of safe tools and equipment, maintained in first class condition, for men to work with; means for reaching each man in the organization, to educate and train him continuously in safe methods; the development of sound, practical instructions to be conveyed to every man in a way he will understand, for the purpose of standardizing safe practice in the minutest detail possible, and a system of checking up performance and requiring strict and uniform compliance with instructions. This is most important, for the money spent in an effort to provide safe equipment and to teach safe methods may easily be wasted through failure to insist upon their utilization to the fullest extent.

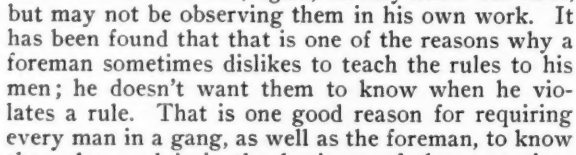
Track Gangs Should Be Protected by a Lookout

Practically every railway of any size has a safety department, but this department alone can accomplish little. The management which creates a safety department and expects it to stop accidents unassisted is likely to be disappointed, and so is the safety agent, for unless the management requires every officer, supervisor and foreman, without exception, to stop the accidents in his jurisdiction and holds him strictly accountable for each one that occurs, the decrease will certainly fall far short of what is possible. If that is not done, the management may conclude, after a few years of indifferent results, that the safety department is a failure or that the safety officer is incompetent (and he may even feel so himself), when all that is wrong is that the management failed to make proper use of him. They simply turned him loose, thinking he would eradicate the causes of accidents and he, like a faithful dog, had been running and barking all over the place, but he had no teeth to bite with and no one backed him up with a gun to shoot what he scared up. It would be small wonder if a good dog got tired of that kind of business after a while and quit hunting.

Foreman Is Important Factor

The only satisfactory way of reaching men in maintenance gangs is through the foreman. He is the "king pin" in the accident-prevention campaign as well as in almost every other campaign in this department. He is constantly with his men, knows their individual peculiarities, and is usually their guide, philosopher and friend. As a rule, men can be taught more quickly and surely by demonstration and correction on the job than in any other way and this means that the foreman must be the teacher and trainer. He will be effective in proportion to the extent that he is held strictly accountable for the performance of his pupils. Obviously, the foreman himself must be trained in safety methods. This can be accomplished in two ways—by letters, circulars and printed rules, and by verbal instruction and coaching of his roadmaster, supervisor or other superior officers. The printed matter will do little good unless the man under whom he works takes a vital

interest in seeing that he understands fully and puts into effect the instructions and advice which it contains. Every foreman is presumed to know the printed standard rules, but frequently an accident reveals that he does not; again, he may know the rules, but may not be observing them in his own work. It has been found that that is one of the reasons why a foreman sometimes dislikes to teach the rules to his men; he doesn't want them to know when he violates a rule. That is one good reason for requiring every man in a gang, as well as the foreman, to know the rules, and it is the business of the supervisor



A Motor Car with Safetv Features

to see that the men are examined and reviewed on the rules, time after time, and that they live up to them.

Safety Rules Should Be Explicit

On some roads, the rules in the standard book, upon which maintenance foremen are examined, cover only the most essential features for protecting traffic. If the so-called "safety rules," giving details of maintenance work, are not included in the rule book or in a special instruction book, that deficiency should be corrected as speedily as possible. Even if a standard set of safety rules has been developed, experience is continually revealing the need for new or additional instructions which must be put out as circulars. A simple arrangement should be provided so that the foreman may file such circulars and keep them intact for future reference, or for turning over to a relieving foreman.

To prevent accidents, we must correct unsafe practices and conditions before trouble occurs; to correct what is unsafe, we must determine what is safe, and to establish what is considered safe, we must issue a rule or instruction on the matter, put out under the authority of a responsible officer, which states clearly what must or must not be done. Now, the foreman can not issue circulars and letters to his men; he must tell it to them. However, he can post the circulars and bulletins in a place provided in his tool house and require all of his men, who can do so, to read them. Some roads issue circulars on practically every accident which occurs, describing just what happened and how it might have been prevented, frequently adding instructions for changes in practice or methods to prevent such an accident from happening again. This has been found very helpful, for when men know that some fellow workmen has been injured while doing a thing in a certain way, they are more willing to learn the better way. When a foreman knows that his job depends upon each of his men promptly learning the rules, he will take the time and trouble to teach them, but if instructions are simply read, laid aside and the same old practices permitted to continue, little reduction will be made in the number of accidents. The biggest job of all is to enforce the rules and instructions literally.

Must Also Impose Discipline

We sometimes hear the remark: "Rules and discipline won't stop accidents. Education is the only remedy." Certainly education is the remedy, but you can educate men by rules and discipline much more quickly and surely than by appeal, argument or persuasion. It is all very well to argue that men should be willing to observe safety rules without compulsion, but the fact is that they often fail to do so, either because they are not convinced that the rule is necessary, or think they can disregard it and still avoid accident. The knowledge that a violation will be watched for and discovered, with the certainty that discovery will mean punishment, goes farther towards securing uniform observance than any other means yet developed. If the men have been fully instructed and coached in what is expected of them, warned plainly of the penalty and given a fair and open hearing when accused, they recognize the justice of the discipline when applied. You cannot punish one man for a violation of the rules and then wink at another doing the same thing. You must treat all alike.

The one purpose of whatever methods are used is to so train every man, from laborer to supervisor and superintendent, that he knows the hazards in every detail of the work he may be called upon to do and will avoid those hazards automatically. It has been demonstrated repeatedly that the first essential of that training is standardization of practice; the second essential is full and complete instruction, and the third, and most important, is discipline.

Safety in Operation of Motor Cars

The frequency of accidents in connection with track cars is causing increased concern to maintenance of way officers everywhere. The substitution of motor-driven for hand-propelled cars has introduced additional hazard, much as has the replacement of horse-drawn vehicles by automobiles on the street. Motor cars save time and energy transporting men and materials and permit a larger territory to be covered by a given force. Motor cars move faster—they carry and pull heavier loads with more jolting and shaking, they are heavier and more difficult to handle on and off the track, and make more noise, reducing the possibility of hearing whistle and bell warnings. Increased speed requires no added exertion of the men, and so there is constant temptation to run too fast. When danger appears the car may be moving so fast the men hesitate to jump to avoid collision, fearing injury if they do so, and there is less time for a decision to be made.

The driver of a track car, like the automobile driver, feels the urge to get to his destination without stops or delays and approaches too close to places where the view is obstructed, or where the rails may be covered with dirt. Unless prevented, he may even try to bluff vehicles at road crossings by coming up to them at fast speed and scaring the automobile driver into stopping for him. He may be tempted to run up to the beginning of a curve around a hill and then send one of his men scrambling up the brow of the hill to see if a train is coming on

the other side; if the train comes sailing around the curve just as he stops, it's too bad for the motor car. If the men, in their confusion, try to swing the motor car off, it may result in a tragedy in several homes. A track car may start out behind a train, increasing its speed as the train proceeds, until both are running from 25 to 30 mi. per hr. If the train stops suddenly for any cause and the men on the car are not watching closely, a bright, sunny day may be instantly changed into one of horror. Besides such major hazards, there are also many chances of injury in handling the cars, by the cars stopping suddenly on account of tools falling off, or by the failure of some part of the machine or running gear.

Improvements in Motor Cars

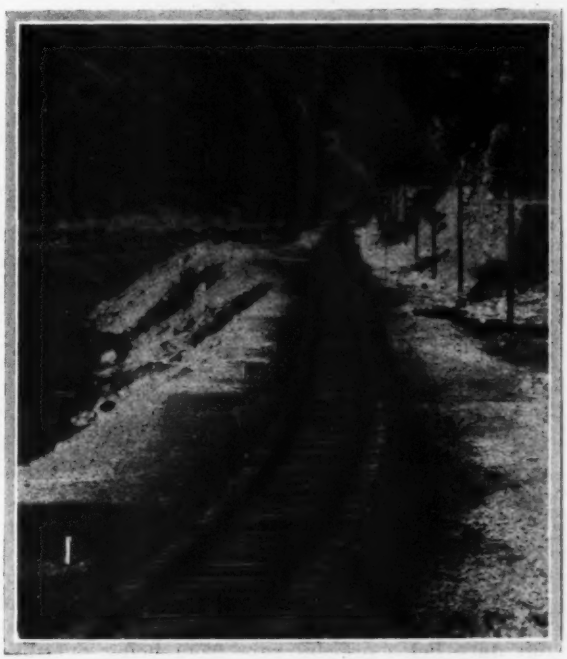
Great improvements have been made in the design and construction of motor cars in recent years and many rules have been developed to safeguard their use, some of which may be mentioned briefly. Almost all gang cars now have sturdy safety rails at each end, with a hand-hold extending the entire length over the deck, to prevent the risk of the men falling off. Men are not allowed to ride on a flat-top trucking-car pulled by a motor, unless it is equipped with a raised seat deck and safety guards, which can be removed quickly for trucking use. Cars are permitted to be coupled only with a standard coupling, which takes up all slack and will not come apart accidentally, but can be uncoupled instantly. Trailers, as well as motor cars, have roller bearings; brakes and running gears are inspected daily by the foreman, and all bolts, nuts and screws are gone over for tightening at a weekly cleaning up of cars. All except the simplest repairs are made by traveling repair men. The instant any defective condition of wheels, brakes or running gears is detected which might cause accident, the car is taken out of service until it is fixed. The ends and sides of tool trays are boxed tightly to a uniform height all around so that no tools or materials can work out while running, and guards are provided to keep the feet and materials from fouling the wheels. In order to keep tools from jolting off the flat deck of trucking cars, a simple, detachable wooden frame has been designed of 2-in. by 4-in. or 2-in. by 6-in. pieces, with holes in their ends to match holes in the deck, through which steel pins are slipped, tying the frame together and holding it to the deck of the car.

Motor cars with free-running engines and a clutch or gear shift are replacing direct-connected cars for gang use, doing away with running and pushing to start them. Heavy cars are being equipped with pull-out lifting bars, boxed in along the side sills, which prevents their being fouled by anything. These bars can be pulled out quickly for use, but cannot be drawn out too far, and are pushed back out of the way when not in use. They are set at a slight incline to prevent their being jolted out by vibration.

Flagging Where View Is Obstructed

Permanent car set-offs have been constructed at frequent intervals and, where possible, located to afford a safe waiting point while a flagman goes ahead to protect further movement. A number of roads require a flagman to be sent ahead of cars at every point where the view is obstructed on single track, the car remaining stationary until he is full flagging distance ahead, and then following only at walking speed. Some roads require this to be done even though the foreman has a written lineup from the telegraph operator showing what time a train left the last station in advance. They are not willing to take the chance of letting a gang proceed around the curve without flagging, even though their information is that no train may reasonably be expected. This flagging, of course, entails some delay to the gang if there are several obscure curves to be passed, but the delay has not been found as great as many would think and this method affords the maximum of safety. With one-man cars there is no practical way of flagging around curves. However, the men operating them, such as bridge inspectors or signal maintainers, are usually highly trained, alert and careful, and the cars are light enough to be removed quickly in case of trouble.

It is considered the best practice always to have the same men sit at the same corners of the cars and to have these men trained as to what they must do to get the car off the track if an emergency arises. These are usually the oldest and most experienced men, and the other men are instructed to get out of the way so as not to interfere with the experienced men removing the car. This, of course, is secondary safety, for primary safety will keep the car from getting in such a tight place. However, having men so



Where Motor Car Safety Depends on Flagging

trained has avoided personal injuries and saved cars from being demolished.

It is extremely important that all men riding on track cars, whether in gangs or alone, be taught to sacrifice the car rather than to take a chance of getting hurt themselves. There is no more critical test of a man's judgment than in deciding when it is time to get out of the way and "let 'er go."

There may be some crooked parts of unimportant single-track lines where the regular trains are so few as to warrant having the dispatcher issue each morning an order or bulletin to all concerned stating that no extra trains will be run on that line between the hours of, say, 8 and 9:30 a. m. Such information might properly permit gangs to go out to work with-

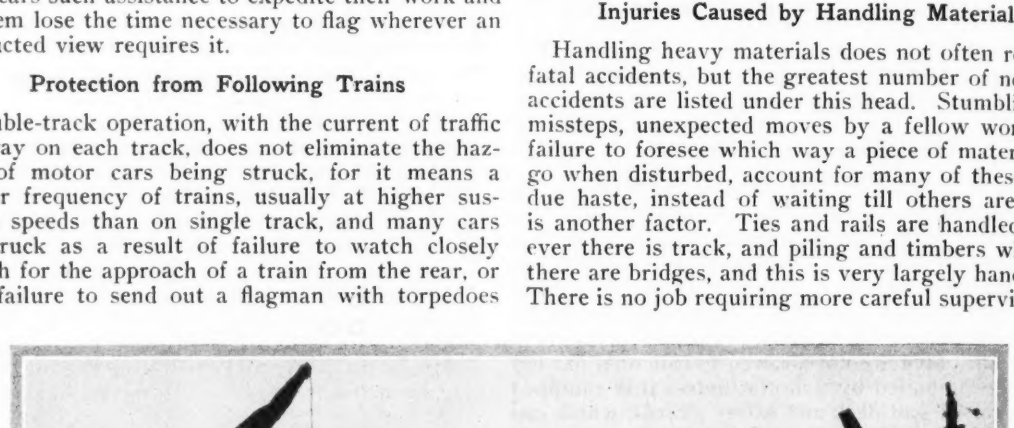
out having to flag around obscure places unless a regular train was due, but they would, of course, have to proceed at such speed as to be able to stop if they should meet a track car going the other way. Such an order would not seriously delay the running of a light engine or extra if a regular train should need help, for the time limit would expire by the time such arrangements could be made. More conservative roads, however, generally prefer not to give track cars such assistance to expedite their work and let them lose the time necessary to flag wherever an obstructed view requires it.

Protection from Following Trains

Double-track operation, with the current of traffic one way on each track, does not eliminate the hazards of motor cars being struck, for it means a greater frequency of trains, usually at higher sustained speeds than on single track, and many cars are struck as a result of failure to watch closely enough for the approach of a train from the rear, or from failure to send out a flagman with torpedoes promptly broken of it. On bridge work and in switching yards it is especially necessary for the foreman or lookout to call the men out, and see that they get entirely into clear of anything that may project or fall from a train. Track walkers and others working alone must be impressed with the need for alertness, and no one should be permitted to bundle up his head so as to prevent his seeing and hearing clearly.

Injuries Caused by Handling Materials

Handling heavy materials does not often result in fatal accidents, but the greatest number of non-fatal accidents are listed under this head. Stumbling and missteps, unexpected moves by a fellow worker, or failure to foresee which way a piece of material will go when disturbed, account for many of these. Undue haste, instead of waiting till others are ready, is another factor. Ties and rails are handled wherever there is track, and piling and timbers wherever there are bridges, and this is very largely hand work. There is no job requiring more careful supervision by



Bridge Men Must Work in Exposed Places

before setting the car on the track where there is not a sufficiently clear view behind. One reliable man riding at the rear of the car on constant lookout duty helps prevent cars from being overtaken unexpectedly. With one man on a car, his only salvation is to keep looking back at brief intervals and to place torpedoes if the situation warrants. Here, as in every other situation, safety depends on alertness and the training of the man. The supervisor who gives the most careful attention to training his foremen, and the foreman who takes the most pains to teach his men, will be those who will have the fewest motor-car accidents.

On roads in this region, keeping men clear of trains while at work is not so complicated by double or multiple main tracks as it is in the East. Having the foreman with the men all the time, or designating one of the men as "boss" if he must be away, insures someone being on the lookout and calling the gang off when a train approaches. If any man shows a tendency to linger when warned, he should be the foreman than these. A foreman who sits down in the shade or visits while his men are unloading a car of ties will never make a safety record. To send his men to unload stringers or piling while he does some odd job simply means that he has no real interest in preventing accidents. The only thing he can do worse than this is to drive the gang to the point where they try to outdo each other. There is greater real efficiency in taking the time necessary to handle material safely than in rushing the job.

Good leather gloves prevent many injuries from splinters and cuts. Two men carrying a heavy tie comfortably are more efficient than one man risking a rupture or strain. Two or three men in each end of a box car or stock car, taking turns throwing ties out of the door, can work without getting in each other's way. If some of the men are on the ground carrying and piling ties, they should be kept away from the car door until a number have been thrown out, then the men inside the car should wait while the men outside clear the ties away. Piles of ties

should be spaced well apart, both to prevent the spread of fire and to give the men room to work between them. In placing ties in the upper tiers of piles, violent tossing or heaving of the ties should be avoided, as this often results in ties falling back and striking a workman. A hook, similar to a baled-hay hook, is handy for pulling ties out of tiers in a car so that the men can get hold of them. Tie tongs are designed for use in dragging ties and slipping them into place under the rails.

Care in Handling Rails

Rails can be handled without anyone getting hurt if enough time and attention are given to teaching the men. Every section gang should have sufficient tongs. Keeping silence, waiting for the word of a designated caller before lifting or lowering, and keeping the feet from under the rails are matters of training. In laying rail, it is important to keep tools and material from under the feet of the tong men. When handling rail in piles, sliding on runners should be done with pull rods five or six feet long, without hurry, and the hands should be kept away from the rails as much as possible.

There is no more hazardous work than is required in picking out one rail at a time in a car of mixed or nested rails under the boom of a rail derrick, and every move with the bar, turning fork or derrick tackle must be watched. As a rule, a bar man at each end of the car and a tackleman are all that should be allowed in the car besides the foreman, who should be located where he can see every move in the car and on the ground. Much depends on the carefulness and alertness of the derrick operator, and the careful movement of the work train if the rails are being distributed along the track. The work should be done slowly until each man has learned his part and then speeded up only as safety permits.

The same general principles apply to handling timbers and piling. Many men have been hurt by the unexpected turning of a stringer or the rolling of a pile. Stripping and wiring between the tiers when loading does much to reduce hazards when unloading in the field, and the same applies to careful piling on the ground for future handling. It is essential to keep turning hooks and lug hooks sharp as well as to make a careful inspection of crabs, winches, ropes and tackle, and to discard them promptly, when a defect develops, until repairs have been made.

Tools in Good Condition

Some of the injuries received while using hand tools are owing to the condition of the tool. The man is not to blame if he has been given poor tools to work with. There may be some argument as to what constitutes a good tool or a poor one, but the management or supervisor should be liberal in judgment and do his part by keeping the tools up to the highest standards. It is poor economy to pay a $100 accident claim through failure to make a 50-cent repair of a tool, and nothing proves the company's sincerity in safety work like first-class tools and equipment for the men, with an efficient system of repair and exchange. The wrench, the clawbar, the jack, the adze, the maul, the chisel, the pick—these tools, requiring considerable exertion, contribute most to the injury record. Few rules can be made as to how they shall be handled, except to space the men apart and to have them look out for the other fellow while using them or laying them down. There is no better chance for a foreman to improve his accident record than in watching the condition of his tools and teaching his men skill in handling them. The way to stand, the way to hold them, the way to brace themselves; these are the essential points.

Falls Account for Many Accidents

Plenty of substantial, well-braced scaffolding and the use of safety belts and safety ropes when working in exposed positions on high structures help to prevent accidents. The fatality rates of painters, structural iron workers and linemen are higher than those of other classes of maintenance men, chiefly because of the ever-present danger of falling from exposed positions, but falls of all kinds account for a large part of the injuries in this department. Keeping floors, walkways, scaffolds and grounds clear of litter is most important. Insisting on men wearing high, all-leather shoes, with good soles, is also important, but the constant drilling of men to look where they are going and getting rid of those who are careless or clumsy is the biggest item in an accident-prevention program.

In conclusion, it should be pointed out that every year from 1923 to 1927, inclusive, about 475 maintenance of way men were killed. More than 26,000 more were injured in each of those years except 1927, when the figure dropped to 23,635, and we believe 1928 will show a further decrease. In this country, up to 1927, there has been an average of more than 26 casualties for each million hours worked by maintenance men. In 1927 it was 23 per million hours. Compared with one large road's record of less than 3 in 1927 and of 2 1/3 in 1928, it is easy to see what a great reduction in accidents can be and should be made.

All it requires is decision to put it through. To the executive it will mean a finer loyalty and efficiency among his forces, a better standing before the public and a saving in claims and damage. To the employees it will mean more wages earned per year, greater satisfaction with the job and a larger measure of life, liberty and happiness; surely the maintenance of way men, whose faithfulness and willingness constitute one of the greatest traditions of railroading, deserve a full measure of all three.

Knitting Spaghetti

"Oh, John", cried Mrs. John as she came back from the kitchen, "you ought to see the cook, the brandy bottle is empty and she's trying to knit a sweater out of the spaghetti."

Every once in a while you see a bunch of men at a job trying to knit a sweater out of a flock of spaghetti, and the foreman is not full of brandy either, although he is loaded up on something just as dangerous although not nearly so refreshing.

When a foreman uses anything but the best methods to do a job of work, when he kids himself into thinking that a cobbled job is good enough and that he is saving time by taking short cuts, he is trying to knit a sweater out of the spaghetti and probably will wake up and find himself not only hungry but cold.

Some foremen figure this way, "It's only a side track, two bolts in a joint are enough", "Yes the gage is getting a little wide and the rail is turning out, but it will run a while yet" or "Sure, the angle bar is broken but I've seen lots more broken angle bars and never a derailment as the result," or "I guess that switch point can run a few more days before I change it out", or, but why prolong the agony, just use your imagination and you will see a whole shop full of spaghetti sweaters - pink ones, blue ones and red ones and a lot of other varieties.

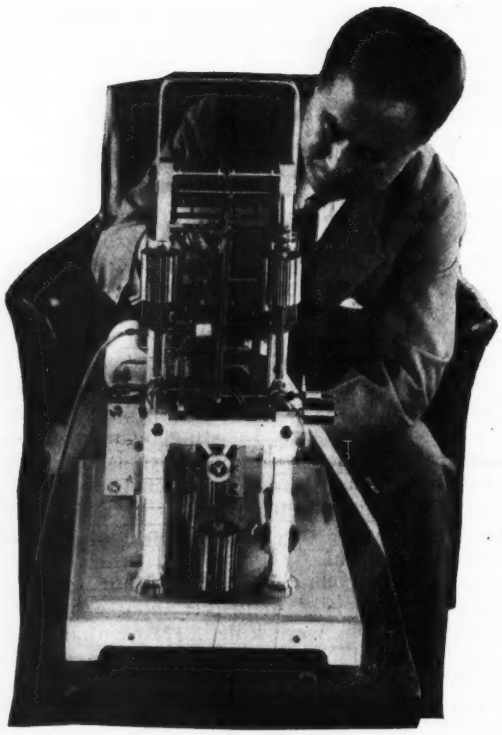
The cook killed the brandy, we have Mrs. John's word for that. And as long as we are going to have to go ahead with our knitting, let's get us a skein of good grey yarn and do a real job; after which we can sit down and get on the outside of the spaghetti and onions; and that's not bologna.

How One Division Engineer Talks to His Men

One of a series of monthly bulletins addressed to the foremen on the Northern division of the Frisco

How Good Is

Delaware & Hudson has used a device 11,000 miles of track to joint conditions



Assistant Engineer Shizuo Hirahara of the D. & H. at the machine on one of its runs

SINCE 1927, the Delaware & Hudson has been operating over its lines a special track-recording device, new in this country until taken up by that road, which is designed not only to be of assistance to the maintenance of way department in determining periodically the condition of the tracks, but also to enable it to study and record all of the irregular movements of cars which affect the comfort of passengers and produce unusual wear and tear on rolling stock. Specifically, this new device records the relative accelerating and braking force of trains, the side rolling of cars due to soft roadbed or centerbound track, the lateral motion of cars due to bad alinement and variations in gage, the relation between speed and the superelevation on curves, and the relative severity of vertical shocks caused by defective rail joints, rough-riding turnouts, crossings, etc.

The new device, which is known as the Hallade track recorder, is a portable self-contained unit, housed in a wooden box about 16 in. long, by 12 in. wide and 20 in. high, and weighs about 70 lb. As used on the Delaware & Hudson, the instrument is set on a rugged stool about 12 in. high, which is placed on the floor of one of the company's business cars, directly over the center of the rear trucks. This car is usually attached to one of the regular passenger trains, but in certain instances it has been made up in a special test train. So mounted, the recording machine travelled a total of from 10,000 to 11,000 miles on the D. & H. up to the first of this year, and in addition, has covered about the same mileage in test service on the lines of the New York Central, the Central of New Jersey, the Kansas City Southern, the Missouri-Kansas-Texas and the St. Louis Southwestern.

Instrument Produces a Four-Line Record

The instrument produces automatically a four-line continuous carbon record on a band of moving paper, 3½ in. wide, which is fed from a roll supply, and which travels at the rate of six inches a minute, regardless of the speed of the train. These lines of the record are produced by four steel tracer pens, designated as Nos. 1, 2, 3 and 4, respectively, which are actuated by suitable mechanisms to produce the records desired. Pen No. 1 is known as the location record pen, by means of which it is possible to record all mile posts and the points of curves, which are necessary to compute the speed of the train and to analyze the other lines of the record intelligently. This pen produces a single straight line which is jogged only at the will of the operator, who presses a pneumatic bulb as the instrument passes the specific points which he wishes to record.

Pen No. 2, which records changes in the speed of the train due to accelerating and braking, and also the

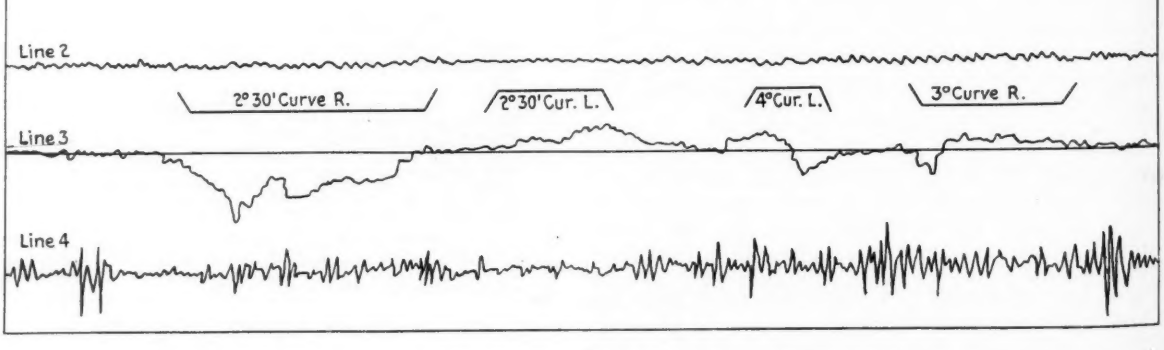


Fig. 1. A Section of the Record Made Over a Poor Piece of Track

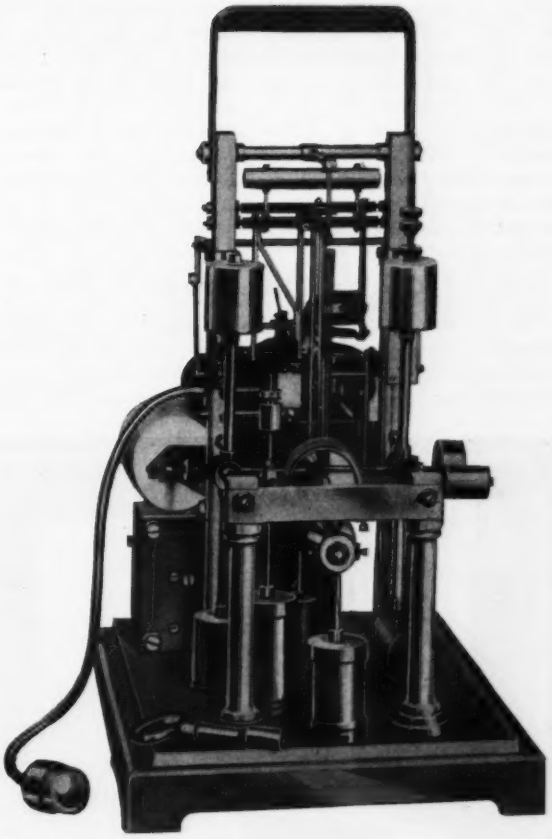
Your Track?

successfully over approximately ascertain line, surface, and superelevation

rough swinging or rolling movement of the car, is controlled by the combined action of two separate parts of the recording machine. One of these parts is a pendulum suspended from an axis transverse to the track, which swings forward and backward as the engine of the train is braking or accelerating, and which remains steady when the draw-bar pull is steady and the train speed is constant. The other of the two parts consists of two symmetrical weights mounted at the opposite extremities of a swinging rod, which, in turn, is mounted on a pivoted axis parallel with the track. In this arrangement the weights are not affected by longitudinal or transverse movements of the instrument, but are sensitive to rolling motions. This is due to the fact that the weights in equilibrium remain stationary when the car, and therefore the instrument, rolls from side to side. The frequency and the amount of this rolling action are recorded by pen No. 2, which inscribes a line with projections to each side of the normal central mark, showing the magnitude and period of the rolling motion. In reading the record of No. 2 pen, there is no possibility of confusion between the effects of rolling, braking and acceleration. Rolling is indicated by a serrated line; braking is indicated clearly by a deviation of the line downward; while acceleration is indicated by a deviation of the line upward. In the latter case, however, owing to the gradual effect of acceleration, the upward movement of the line, in most instances, is so slight that it is practically unnoticeable.

Instrument Checks Superelevation on Curves

Pen No. 3, which records transverse oscillations or the lateral movement of the car, as transmitted to the instrument, is actuated by a large pendulum supported on an axis parallel with the track, which responds to lateral shocks or movements. The pendulum connected to pen No. 3, which is free to swing on ball bearings,



A Rear View of the Recorder

is provided with a damper in the form of an air dash-pot.

While the record of this pen discloses the faulty alinement and gage of tangent track, whether caused by wear or inaccuracy in relaying rail, it is the more effective because it indicates clearly the relative correctness of the alinement and the superelevation on curves. By reason of the construction of the instrument, if the superelevation on a curve is correct for the speed at which it is used, the floor of the car as it passes around the curve, and consequently the instrument, is tilted until it lies in a plane at right angles to the resultant of the pendulum weight and the centrifugal force which throws the pendulum outward. Since the pen-

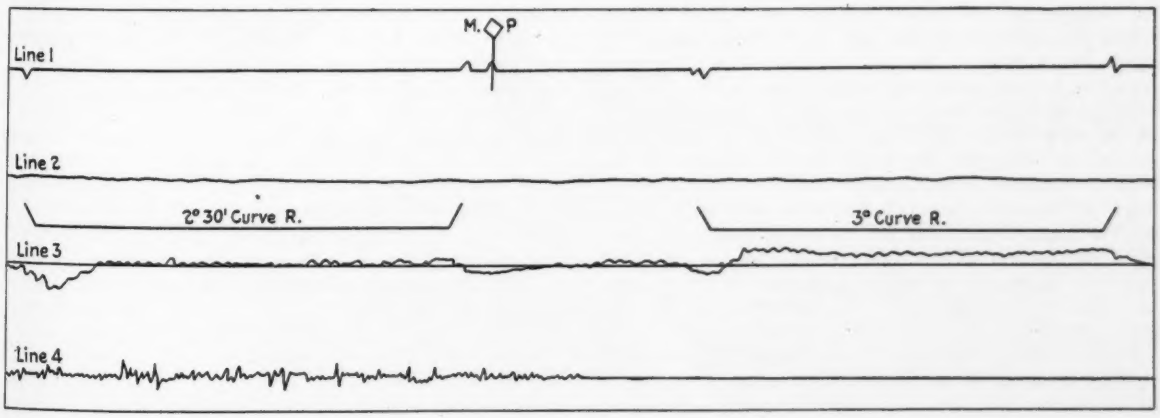


Fig. 2. A Section of the Record of the Recorder Over a Good Piece of Track

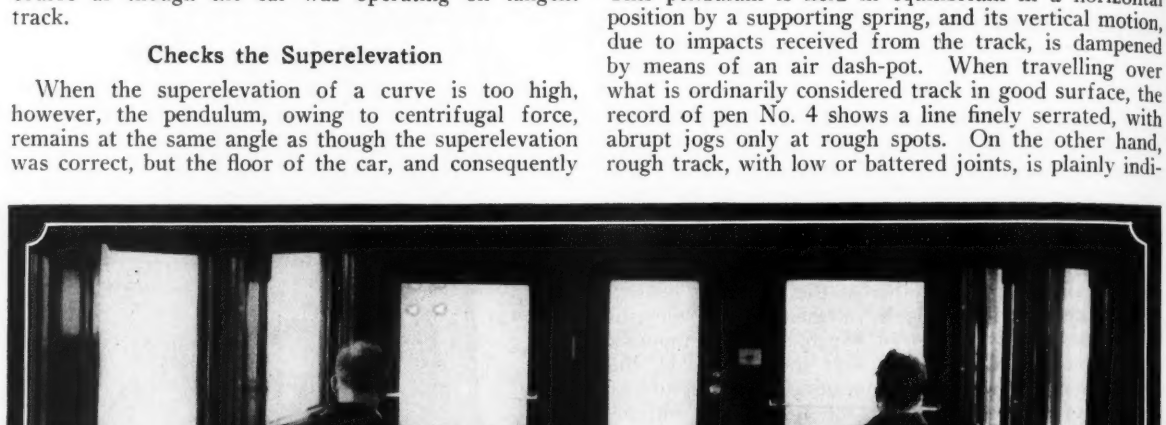
dulum is acted upon by the same forces as the car, and therefore naturally assumes a line corresponding to the resultant referred to, the relative positions of the pendulum and the instrument on a curve of proper superelevation for the speed at which the train is moving, are the same as when the machine is standing vertically at rest. Consequently, when travelling around a curve with the proper superelevation, the pen actuated by the pendulum remains on the center line of its course as though the car was operating on tangent track.

Checks the Superelevation

When the superelevation of a curve is too high, however, the pendulum, owing to centrifugal force, remains at the same angle as though the superelevation was correct, but the floor of the car, and consequently the base of the instrument, is at an angle greater than the correct angle, and therefore, the pen deviates to one side of its correct course. Similarly, when the superelevation of a curve is too small, the base of the instrument is at too small an angle, and therefore, the pen deviates to the other side of its correct course. When the curve is to the left, a deviation above the center line course of the pen indicates that the superelevation is too great, and a deviation below the line indicates that the superelevation is insufficient. When the curve is to the right, the opposite is the case. The amount by which the superelevation is too great or too small is obtained approximately by measuring the distance on the chart between the mean of the deviation and the center line of the record itself, and multiplying the result by 10. Thus, if the mean of the deviation measures ⅛ in., the error in the amount of superelevation provided is equal to ⅛ times 10, or 1¼ in. approximately.

Bad alinement on a curve is shown independently of the condition of the superelevation by serrations in the line record of pen No. 3, and, if desired, it is possible to calculate the lateral force producing any particular serration in the line. As a rule, however, this calculation is not made, it being sufficient to know the relative condition of the alinement, whether good or bad.

Pen No. 4 of the instrument is sensitive only to vertical movements, and therefore indicates only such track conditions as low joints, rough-riding crossings, etc. This pen, like pen No. 3, is connected to only one pendulum, which is supported on a horizontal arm projecting at right angles to an axis transverse to the track. This pendulum is held in equilibrium in a horizontal position by a supporting spring, and its vertical motion, due to impacts received from the track, is dampened by means of an air dash-pot. When travelling over what is ordinarily considered track in good surface, the record of pen No. 4 shows a line finely serrated, with abrupt jogs only at rough spots. On the other hand, rough track, with low or battered joints, is plainly indicated by a line of successive prominent jogs or serrations.



The Track Recorder Is Set Directly Over the Rear Trucks in a Business Car

Records Are Mainly Comparative

In addition to the condition of the track, the records obtained from the recorder are influenced, more or less, by three other factors. These are the riding quality and sensitiveness of the car carrying the instrument, the speed at which the car is moved over the track, and the adjustment of the instrument itself. Experience has shown that all three of these factors affect the character of the record obtained, but, at the same time, it has been shown repeatedly that, in spite of these influences, the degree of faulty track is clearly discernible. The important thing to be kept in mind in interpreting the records made by the instrument is that the record is better adapted for comparative purposes than for determining to a fine degree the actual magnitude of a defect in the track at any specific point.

Neither the effect of the car nor the adjustment of the instrument seriously affects a true understanding of the record, for, in the first place, if it should happen that a fault is indicated continuously throughout the length of the chart, it is obvious that the car is at

fault, because, however bad the condition of the track, it is highly improbable that the same fault will be continuous over every mile under observation. The adjustment of the instrument does not seriously affect the record, and, in any event, lack of adjustment is readily discernible and easily corrected.

Speed very definitely affects the record obtained, but above the minimum speed requirement of 35 miles, which is necessary for the proper operation of the instrument, the fault indications are directly proportional in magnitude to the speed at which the instrument is operated over the track. Knowing the speed over each mile, as computed from the record of mile post indications on the chart, it is therefore possible to determine readily the relative conditions of various sections of track passed over at different speeds, in spite of the fact that this true relative condition is not apparent from the chart when the speeds have varied on different tests.

Examples of the Records

Two good examples of the records made by the Hallade recorder are shown in figures No. 1 and No. 2 on pages 296 and 297. The first of these shows the record made over a piece of track about 0.8 mile in length, where a moderate amount of rolling action was imparted to the instrument owing to flexibility in the roadbed, or center-bound track, as is indicated by line No. 2, and where the superelevation on certain of the curves was incorrect and not uniform, as is shown by line No. 3. The heavy serrations in line No. 4 show that the rail joints on this stretch of track were also in bad condition.

Figure No. 2, on the other hand, shows a piece of track of the same length which is in practically perfect condition, it being noted that practically no rolling motion is indicated in line No. 2, and that the superelevation provided on the two curves is almost uniform. Some rough joints are indicated by line No. 4 on the first half of the track shown, but no hammer whatever is apparent at joints in the latter half of the track covered. In the cases of both of the records shown in figures 1 and 2, the speed at which the instrument was operated over the track was between 40 and 45 miles an hour, so that the two records are closely comparable.

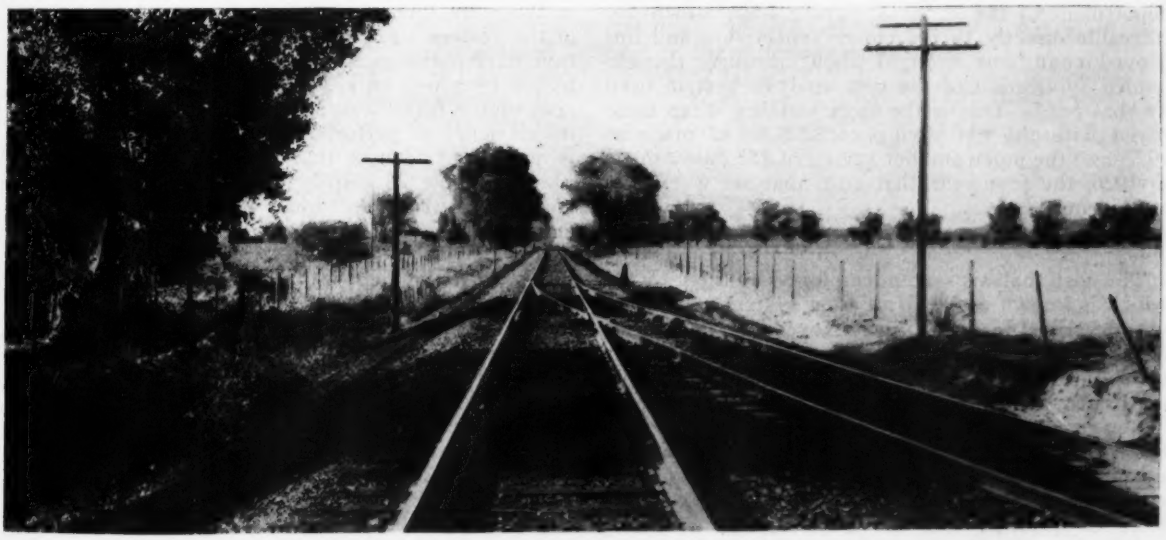
In the operation of the recorder on the D. & H., it is the practice to run over all main line tracks five or six times a year, two of the runs being made just before and after laying rail. Thus, by means of these records, the maintenance of way department is afforded comparable records of the track at the various seasons of the year, and is in a position to know where track conditions are the poorest and where the greatest maintenance effort must be concentrated. This is particularly desirable during years or seasons when maintenance appropriations are reduced, and when it is necessary, therefore, to confine the major items of maintenance work to those points where it is urgently required, or where it will do the most good.

The records of the recorder are also of value to the men on the divisions, who are thereby afforded a bird's-eye view of the conditions on their respective territories, and likewise, to the roadmasters and foremen, who are enabled to locate definitely the specific points which require special attention. The records have also proved of value in precluding or delaying the general overhauling of sections of track which have been reported in bad condition as the result of visual inspection, but which are shown by the machine record to have bad conditions only at specific points, which can be corrected readily without the greater expense of overhauling the track throughout.

Used During Annual Inspection

Another use made of the instrument and the records which it produces is at the time of the annual track inspection, when a complete trip is made over the system as a check on the markings of the special judges who rate the various track sections in connection with the awarding of prizes. This practice has proved most effective, and has had the effect of giving the track foremen greater confidence in the system of awarding track prizes.

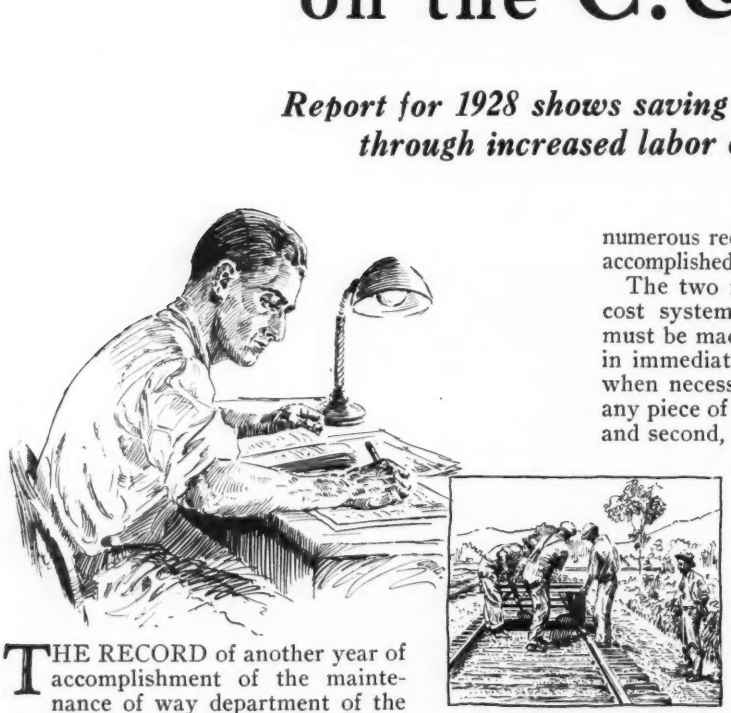
All of the operation of the recorder has been carried out under the general direction of H. S. Clarke, engineer maintenance of way of the D. & H., while all of the actual work of obtaining the records has been in charge of Shizuo Hirahara, assistant engineer. The recorder described is the invention of J. Hallade, Paris, France, and was supplied to the D. & H. by J. Edward Green, sales agent of the inventor, at Paris.



On the Southern Pacific

Cost Analysis Pays on the C. & O.

Report for 1928 shows saving of $708,826 through increased labor output



THE RECORD of another year of accomplishment of the maintenance of way department of the Chesapeake & Ohio under the influence of the cost analysis work which is being carried out by that road, is further convincing proof that cost analysis work, properly organized and directed, can bring about large economies in planning and carrying out the work of maintenance of way forces. The most striking piece of evidence in this regard, shown in the annual report of the cost engineer of the C. & O. is that there was a gross saving of $708,825.98, and an actual net saving of $651,809.20 in the labor expenses of the maintenance of way department of the C. & O. during 1928, which are traceable directly to the closer supervision and improved conditions brought about through the extended application of the cost analysis system used by that road. This is the more striking when compared with the net saving of $298,305.42 made in 1927, and the much smaller saving of $51,240.92 made in 1926, the first year that cost analysis work was carried out.

Details of the C. & O. System

The cost analysis system employed by the C. & O., which is known as the Unit Cost system and which was described in detail in the November, 1927, issue of *Railway Engineering & Maintenance,* is, briefly, a method for making efficiency and cost analyses with the primary purpose of effecting immediate economies in the handling of maintenance of way work. It is based primarily upon the reports of the foremen, and upon the records and observations of a group of specially trained assistant cost engineers who work in close co-operation with the foreman, and who keep numerous records of actual performances and the work accomplished.

The two major objectives recognized by the unit cost system are: First, that prompt classification must be made of each day's work in order that those in immediate charge of maintenance operations can, when necessary, take immediate corrective steps on any piece of work, while the work is still in progress; and second, that summarizing the facts and applying the knowledge gained by comparison with previous records is essential to an improvement in the general planning and handling of work. The first of these objectives, and the one which it is felt has been the principal factor in the reduction of costs thus far, is accomplished by the placing of trained men on the territories of the various track supervisors, to rate the daily work of the track forces and to advise those in charge of the results accomplished. The second of these objectives is accomplished by the careful records kept by the cost department, although it is felt that the benefits derived from this phase of the work are proportional to the extent to which each officer interests himself.

Performance Increased 17.2 Per Cent Over 1925

During the last year the unit cost system was in effect on 25 supervisor's districts on the C. & O., embracing 745 miles of roadway and including all of the main lines and more important branch lines of the system. The amount of work under observation during the year amounted to 11,163,441 man-hours, of which only 303,809 man-hours, or 2.7 per cent of the total, was not subjected to rating as to its efficiency of performance. In this connection, it is significant to note that the total man-hours employed on the 25 districts in 1928, is 104,563 man-hours less than the total number of man-hours employed on the 22 districts which were under observation in 1927. That this large reduction in man-hours of employment was effected without a sacrifice in the quality of work done, or a let-down in maintenance, is evidenced by the results of the annual roadway inspection for the year, which gave the tracks of the C. & O. a rating three per cent above that of the previous year.

From the careful records kept by the cost department, the general average efficiency of the track forces for 1928 was established at 87.9 per cent, as compared with 83.4 per cent in 1927, 80.5 per cent in 1926, and 75.0 per cent in 1925. This indicates an

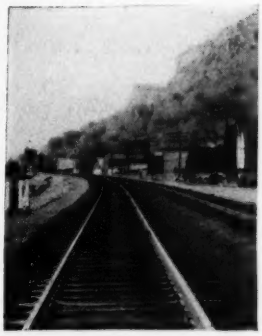
improvement in the efficiency of performance for 1928 of 17.2 per cent over the performance of 1925. This improvement in performance over 1925, which was the basic year, resulted in the increased output of the maintenance forces to the value of $708,825.98, this saving being made in the maintenance of way labor payroll of the C. & O. on the districts under survey, which for 1928 totaled $4,161,884.48.

Month	Maintenance of Way Hours	Average Hourly Rate	Payroll	Ratio of Improvement Over 1925	Increased Output Value
January	750,498	$0.410	$307,704.18	1.117	$36,001.39
February	753,799	.414	312,072.79	1.159	49,619.57
March	807,338	.405	326,971.89	1.174	56,893.11
April	829,473	.406	336,766.04	1.174	58,597.29
May	911,453	.402	366,404.11	1.175	64,120.72
June	917,651	.404	370,731.00	1.168	62,282.81
July	919,171	.405	372,264.26	1.162	60,306.81
August	955,839	.404	386,158.96	1.176	67,963.98
September	868,659	.408	354,412.87	1.180	63,794.32
October	1,068,759	.400	427,503.60	1.191	81,653.19
November	770,482	.411	316,668.10	1.180	57,000.26
December	689,873	.412	284,227.68	1.178	50,592.53
Year	10,242,995	$0.406	$4,161,884.48	1.172	$708,825.98

One of the significant facts pointed out again in the report for 1928, is that the savings, or the reductions in cost effected, are not confined to specific work, nor are they confined to any particular season of the year. This latter fact is indicated clearly in the accompanying table, which shows the distribution of the work on the C. & O., the ratio of improvement over 1925, and the value of the increased output, for the year, and for each month. Deducting from the gross increase in output in 1928 of $708,825.98, the sum of $57,016.78, which was the total cost of operating the unit cost system on the C. & O. for that year, including salaries, gives a net saving for the year of $651,809.20 as the result obtained from the closer supervision made possible under the unit cost system.

We are indebted for the information contained in this article to C. J. Geyer, assistant to the vice-president in charge of operation of the C. & O., who, until April 15 of this year was engineer maintenance of way, and to C. H. R. Howe, cost engineer of that road, under whom the unit cost system was organized and has been carried out.

A Check on Timber Treatment



On the La Crosse Division of the Burlington

THE nineteenth annual report, as of January 1, 1929, on the experimental treated ties installed in 1909-10 on the Chicago, Burlington & Quincy, showed that of a total of 21,605 ties installed of various divisions in those years, 12,830 ties or 59 per cent, had been removed for all causes, of which 25 per cent of the total placed were removed by reason of decay, while 34 per cent failed from all other causes, such as rail or tie-plate cutting, splits, checks, shakes or breaks, including those broken by derailments or dragging equipment.

In placing these experimental ties, it was decided to make the tests of such a nature as to secure data, not only as to methods of treatment, but also as to the life of ties of different kinds of wood treated by these methods under varying conditions of traffic and climate. To this end, ties of the various kinds of wood, treated by each process, together with untreated ties of the same varieties of wood, were installed in test sections on each division of the road, the usual procedure being to place about one thousand ties at each location, of which approximately 15 per cent were untreated. For proper identification, each tie was marked with a dating nail showing, by arbitrary characters, the kind of wood and treatment used. When the ties were placed, a blue print was prepared for each test section, showing the location of the different ties. Whenever the foreman finds it necessary to remove one of the test ties he is required to report the kind of wood and treatment as well as the cause of removal. In this way a complete record and a life history of each tie has been obtained.

The Burlington is operated as two grand divisions, designated as Lines East of the Missouri River and Lines West of the Missouri River, respectively, and summaries of the annual records are made for each of the grand divisions. Aside from the advantage of these summaries for the general officers, they have the further merit of consolidating the data for regions which differ markedly as to climate. Thus, on Lines East, the annual rainfall ranges from 30 to 35 in. in the northern part of the territory to from 35 to 40 in. in the southern part, while on Lines West the annual precipitation decreases from an average of from 30 to 35 in. along the Missouri river to an average of 15 in. in Northwestern Nebraska.

On Lines East, 13,870 treated ties and 2,040 untreated ties were placed in 18 test sections and on Lines West 7,735 treated ties and 1,224 untreated ties were installed at seven different locations. With but few exceptions, the untreated ties failed from decay in from four to six years. The behavior of the treated ties, classified as to methods of treatment, is shown in the following tabulation:

Process	Total Placed	Percentage Removed for Various Reasons: Decay	Other Causes	All Causes
Lines East				
Straight creosote	2,027	11.5	16.7	28.2
Card process	10,259	22.9	33.6	56.5
Burnett (zinc)	1,584	45.9	26.1	72.0
	13,870	23.8	30.3	54.1
Lines West				
Straight creosote	1,231	19.2	33.8	53.0
Card process	5,593	29.0	39.9	68.9
Burnett (zinc)	911	31.8	57.8	89.6
	7,735	27.8	41.0	68.8
Total				
Straight creosote	3,258	14.4	23.2	37.6
Card process	15,852	25.0	35.8	60.8
Burnett (zinc)	2,495	40.8	37.7	78.4
	21,605	25.3	34.1	59.4

It will be noted that the percentage of test ties removed on account of decay was smaller, on both grand divisions and for each kind of treatment, than

that of the ties removed for other causes. At the time these ties were installed, tie plates were not used as extensively as at present and those that were used were generally smaller than they are today. The weight of rail in tracks has also increased to a considerable degree during the same period. For these reasons, more ties were removed on account of rail cutting than for any other cause aside from decay, and there is no doubt that this factor was also the cause of hastening the failure of many of the ties which were removed on account of decay.

Many of the ties installed in these test sections were of woods not commonly used for this purpose and included such varieties as ash, birch, cottonwood, hickory, soft maple, poplar and sycamore. Some of these, notably cottonwood and elm, demonstrated surprisingly good resistance to decay. As these woods are, for the most part, of soft and open structure, the failures from causes other than decay were relatively high. Since the Burlington has treated all of its ties for a number years, the information gained from these test sections is of constant value not only as a measure of the value of the treatment, but also as to the comparative values of the different varieties of wood employed in the tests.

In addition to the test sections installed in 1909-1910, other test installations of treated ties, as well as of treated crossing plank, flooring, bridge timbers and piling, have been made from time to time, until at present there are 80 installations of track ties, 3 of bridge ties, 5 of piling, and 4 of bridge timbers, which are inspected annually by the superintendent of timber preservation of the road accompanied by the maintenance officers of the various divisions on which they are located. The test sections were installed under the supervision of the late J. H. Waterman, who was superintendent of timber preservation for the Burlington until his retirement in 1927, and since that time the inspections have been made by his successor, H. A. Duncan.

Nothing will prevent signal failures as much as the renewal of poor bonding. On every section there is still a great deal of rail to be rebonded. In bonding old rail, use the same care as in bonding new rail. Bend the bond wires standard; see that the channel pins are well driven and that the protectors are put on at the time the bond wires are placed. See that the old bond wires and protectors are picked up and properly disposed of. **Remember that every man must clean up after his own work.**

PAINTING.

It is useless to paint dirty or moist surfaces. Bridges and buildings must be thoroughly cleaned before painting. Don't try to paint the exterior of buildings or bridges in wet weather. Brush out the paint thoroughly so as to reach all remote parts and corners. When painting signs and bridge numbers, be sure to stencil the correct numbers. Before signs are painted, they should be straightened. **Keep in mind the value of good appearances.**

LAYING RAIL.

All new rail must be laid with the brand out. Use expansion shims of the proper size depending on the temperature. Use the thermometer to determine the temperature. All new rail must be full plated with tie plates of the latest design when the rail is laid. Don't mix "Goldie" tie plates with "Cross-Rib Sloped" plates. Before the work is left at night all ties must be full spiked, joints full bolted and any low ties tamped up to the rail and full spiked.

The section foreman must be present when rail is laid on his section and is jointly responsible for work being done according to standard requirements and everything left in safe condition **Don't shirk responsibility.**

Before leaving the work for the day, the track foreman and signal maintainer should get together and go over the work done during the day to be sure that no important detail has been overlooked. The maintainer should see that the necessary material for bonding is on the ground sufficiently in advance of the time that the foreman wishes to lay rail so that there will be no delay on that account. **Co-operate at all times and especially when joint work is being performed.**

TRUNKING REPAIR AND RENEWAL

Trunking repair or renewal should begin at the bottom. Don't place new trunking on rotten stakes. Replace them, using long stakes where needed. Short stakes set in a ballast shoulder will not hold the trunking in place. Don't place new capping on rotten trunking. Renew the trunking, making good close joints. **Don't be satisfied with loose, open joints.** Nail the capping sufficiently to prevent it warping under weather conditions. Be careful not to drive nails in the trunking groove. They always cause trouble.

RAISING TRACK AND SPOTTING UP

Main track must not be raised out of face without top of rail stakes except by special permission.

Don't try to raise or spot up track without using the level board. **A good job cannot be done without it.**

Ties must be honestly tamped. Don't shirk this job. Tamp solid under the rail and 15 inches inside. Except at ends of bridges, ties should not be tamped solid in centers, but shovel tamped loosely to prevent center bound track. At ends of bridges, ties should have a very solid bearing and at least eight ties from each end of bridges should be tamped solid with tamping machines, picks or bars all the way across. Don't leave them loose even in the centers or it will be necessary to do the job over again in a few days, thus wasting time and money in jumping back and forth from one job to another. Use tamping machines and picks for stone or slag ballast and tamping bars for cinders when doing final tamping and when spotting track up to surface.

Don't go away and leave partly open track which will only fill with water and soon make muddy ballast and low joints.

Line track to stakes or with string before trimming. Track left in bad line will not stay in good surface.

Good line and surface are equally important and should go together.

Keep track filled in with clean ballast and properly trimmed to standard template.

Creosoted drain boxes should be placed at road crossings, switches, in cuts and all other places where water is liable to accumulate. Drain boxes should be placed at frequent intervals on double track, especially on grades, for conveying the water from between tracks. Do not allow the water to run long distances in cuts or between tracks. Get it away from the track quickly by ditching, putting in drain boxes, and cast iron pipe. Do not place drain boxes with the inlet end so high that water cannot freely enter. **Always keep drainage in mind.**

Have drain boxes distributed well ahead of raising and put them in.

With raising and reballasting track must go the raising and trimming of signals, cable posts, battery wells, battery chutes, and the renewal of bonding where its condition is unsightly.

In raising signals and cable posts the dirt under and around the foundation must be well tamped. If this is not done, the signal or cable post will not long remain plumb and the work of plumbing will have to be done over.

The raising of signal equipment and the renewal or repairs of trunking should be done after the track is raised and before it is trimmed. Such work should be programmed by the interested foremen to avoid interference with other important duties.

The secret of success in railroad maintenance is proper planning of work in advance and following the plan, keeping forces supplied with proper kind and amount of material in advance. Unless work once begun is completed in a thorough and workmanlike manner, it will not be successful. The man who jumps from one place to another, slighting his work and never finishing what he begins, will never keep ahead of his work.

First-class work in every respect is what counts in maintenance.

E W HAMMOND,
Engineer Maintenance of Way

W L CONNORS,
Signal Engineer

Approved:

E. F ROBINSON,
Chief Engineer

Rochester, N Y.,
September 1st, 1927

BUFFALO, ROCHESTER AND PITTSBURGH RAILWAY COMPANY

ENGINEERING DEPARTMENT

BULLETIN No. 2

DETAILS OF MAINTENANCE WORK

RENEWING TIES.

Old untreated ties taken out of track must be piled and burned. **Don't leave them scattered along the subgrade or thrown down the bank.** Pile them every few days and set fire to them once a week, except in territory where fires are prohibited.

Remember that instructions require that treated ties taken out of track must be piled separate for loading and shipping to the Timber Preserving Plant at Bradford unless authority is given to use them elsewhere.

Use tie tongs for pulling ties into the track. Don't allow men to strike picks, shovels or other sharp tools into the tie.

Every tie must have two tie plates of the proper size. **Don't put ties in the track without tie plates of the right size.**

If tie plates are not supplied, ask the Roadmaster for them and stop putting in ties until you have the plates.

Every treated tie must have a dating nail. Don't delay driving them in the ties. Have a supply of dating nails on hand and put them in before stopping work each day. 1927 dating nails must be placed 42 inches from the base of the east rail on single and north bound track and 42 inches from base of west rail on south bound track.

When treated ties are taken out of track and turned over and used again, the old timber and dating nails must be pulled out and driven again in the top face in proper position. If there are no nails in the ties, report to the Roadmaster and ask for instructions. **Don't put dating nails in the wrong place on ties.**

When adzing ties, follow the standard instructions. Use tie plate gauge. Carry adzing out five inches each way from the base of rail. When treated ties are adzed, brush treat the adzed part with hot creosote immediately. Clean up the chips. **Each man must clean up after his own work.**

REBONDING.

The rebonding of track out of face is necessary under at least two conditions:—First, when bond wires, even though good, are pulled out of place and present an unsightly appearance. Second, when wires are rusted so that the conductivity is appreciably reduced. **Bonding must not only be good, but must look good.**

The B. R. & P. Secures Uniformity of Practice by Issuing Bulletins Like the Above

Water Pockets—How They Form and How to Avoid Them

By W. H. CLEVELAND
General Track Inspector, Atchison, Topeka & Santa Fe, Wellington, Kan.

THE deformation of roadbed, its origin and prevention, and the remedies that may be employed, furnish a topic for annual discussion. This is the season when such conditions are most annoying.

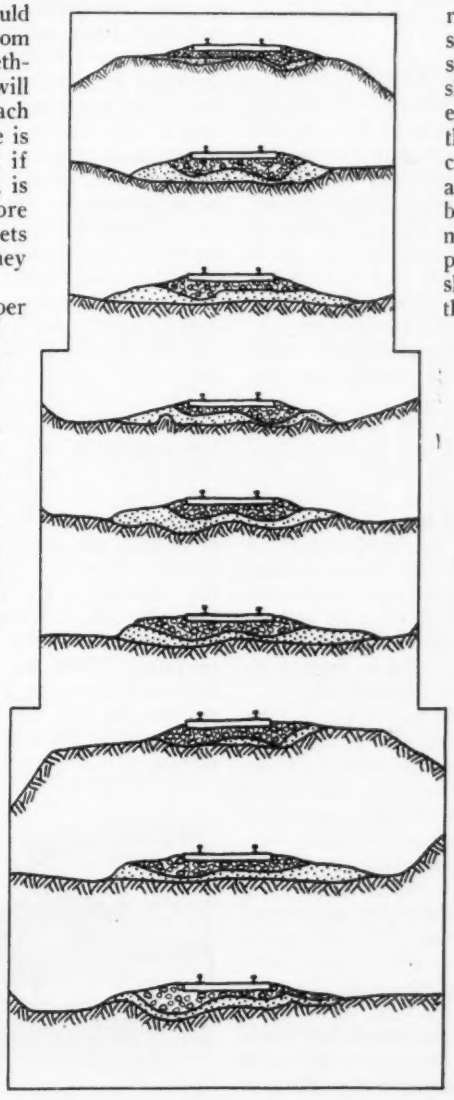
Water pockets, when once formed in the subgrade beneath the ballast, are very troublesome and if prompt measures are not taken to eliminate them in the initial stage, will develop progressively and produce serious conditions that will give rise to heavy maintenance expense. Superficial work affords but temporary relief and may actually aggravate the condition; hence, prompt action should be taken to drain the moisture from the subgrade thoroughly. The methods employed should be such as will best meet the requirements of each individual location. Tile drainage is most commonly resorted to, and, if installed properly and adequately, is usually effective; but it is much more satisfactory to prevent water pockets than it is to cure them after they have formed.

Water pockets have no proper function in either cuts or fills and are never the result of deliberate intent in railroad construction, although cases may be cited of practices which were so conducive to the formation of pockets that deliberate effort could hardly have been more effective. In general, water pockets are produced when ballast or other porous material forming a superficial stratum is forced down by the weight of traffic into a roadbed composed of impervious material.

In Cuts and Fills

When ballast is placed on a newly constructed roadbed without sufficient time for solidification, water pockets occur more frequently in fills, but where a roadbed has been fully solidified before any ballast is placed on it, the water pockets are more frequently noted in cuts, although very little roadbed is immune to pockets when improperly handled. The subgrade in cuts is more susceptible, because lack of adequate drainage results more quickly in the saturation that renders material incapable of resisting the pressures that result in the formation of pockets.

When the subgrade is once deformed so as to create water pockets, it is almost incapable of correction by any rational methods or at any reasonable expenditure, and to continue superficial measures that afford only temporary relief results in a perpetuation of high maintenance costs, hazards to traffic and continued progressive deformation which intensifies the trouble. Hence, some efficient method should be pursued that will thoroughly eliminate the trouble.



Some Examples of Water Pockets

It is better, however, to build the roadbed and track so as to avoid such troubles. Adequate drainage should be provided and the subgrade should be correctly formed, with enough crown to insure drainage to the shoulders. Materials that become unstable when wet should be avoided, if possible, in building roadbeds, especially for the crown immediately beneath the ballast. The placing of ballast on the subgrade should be carefully done, and not less than 10 in. of a good grade of crushed stone should be placed at the first application; this to be followed by a finishing raise sufficient to permit pick tamping.

Must Apply Enough Ballast

A light initial application of ballast is one of the common causes of depressions and water pockets in the subgrade. Crushed stone ballast is most valuable because of the interlocking or overlapping of the particles, those of the first layer beneath the ties overlapping those of the layer next below and so on, widening the area of support in each direction to a point where the supporting area for one tie converges with that of the ties on each side, thus, producing a common area of support for the track which exerts substantially a uniform pressure on the roadbed. The insertion of deep ballast, properly placed, with ties averaging 8 in. wide and spaced an average of approximately 20 in., center to center, should give a sufficiently uniform distribution of load over the subgrade to prevent any upheaval between the ties, which

is a common occurrence when insufficient ballast has been placed. New ballast should be inserted with one raise, providing for a light finishing raise after the first raise has compacted under traffic.

The greater cost of placing deep ballast in the initial insertion is negligible if allowance is made for the subsequent saving in maintenance cost and the preservation of the foundation for continued and adequate support. When a light insertion of ballast is placed over a soft subgrade, the interlacing of the particles is not complete and there is not sufficient ballast to provide uniform support for the ties. Depressions are then formed beneath the ties as the ballast is thrust into the subgrade. This action, accompanied with some displacement of the subgrade directly beneath the ties in each direction toward the cribs between the ties, results in the formation of pans or depressions beneath the ties, the subgrade becoming virtually corrugated.

The proper function of porous ballast is to receive the moisture and conduct it quickly to the subgrade, which should have sufficient crown to cause the water to flow to the ditch on either side. In a case like that described above, the moisture is retained in the depressions and sinks into the subgrade; with each rainfall the adverse condition progresses, and further applications of ballast must be made simply to obtain temporary relief.

Do Not Place Porous Ballast on New Roadbed

The improper and ill-advised insertion of ballast and its subsequent maintenance, regardless of the amount of ballast placed, is responsible for much of the trouble experienced with water pockets in soft and moderately stable subgrades in both cuts and fills. Crushed rock or other porous ballast should not be placed at once on a newly constructed roadbed, but instead, the track should be maintained on a good grade of soil until the road has ceased to settle and has become solidified by traffic and moisture. After that, porous ballast may be placed, and if properly placed, good and lasting results may be expected with a minimum of maintenance expense.

When applying new ballast on a line that has been in operation on soil, it will be found that in many locations the ties have been depressed an inch or two into the soil. This condition prevails most frequently on the low sides of curves. Because of the superelevation, the moisture percolates to the low side and should be released there. Where such conditions exist, raising the ties will disclose pits in the subgrade where the ties rested, and if such cavities are filled with ballast, water pockets will be formed that will grow worse progressively after each rainfall. Such conditions should be corrected before the ballast is unloaded.

When the first insertion of new ballast is made (the first raise), the ballast should be filled uniformly under the ties for their entire length in order that the compression of the ballast will be uniform for the entire length of the ties and thereby preserve the contour of the subgrade and avoid its upheaval at the track center and its corresponding depression or the depression of the ballast beneath the rails. Such conditions, once formed, are serious, more especially on curves where the moisture drains to the low side and where heaving of the subgrade at the track center practically obstructs the drainage from the opposite side. In subsequent maintenance, where the roadbed is of good material and has become solidified and the ballast compressed, tamping may be omitted for a few inches in the immediate track center; but where the roadbed is known to be of soft, yielding material, the track centers should always be tamped in order to prevent the upheaval of the subgrade at that point, with accompanying displacement of the subgrade at the most vulnerable point—under the rails.

Tamp Ties for Full Length

There is no danger of getting center-bound track from center tamping over a soft subgrade, as the track will settle for its full width immediately under the ties. The bugaboo of center-bound track is one great cause of deformed roadbed and water pockets. The common method followed is to omit center tamping, regardless of the nature of the subfoundation, thus producing water pockets. The tamping of the ties outside of and for an equal distance inside the rails will not support the present-day wheel loads and will result in depressing the ballast into the subgrade under the rail.

In case center-bound track develops on roadbed of unusual solidity, the condition is not permanently serious but is easily and permanently corrected with no ill effect on either the ballast or roadbed. Rails, ties and ballast, when worn out, can be renewed, but not so with the subgrade. The foundation upon which all depends, when once distorted, cannot be corrected at any reasonable cost.

Much care should be exercised when restoring the surface and superelevation of curved track, especially of single-track curves where there is traffic in both directions and where grades are continuous in the one direction for long distances. The upgrade, slow-speed trains are operating over excessive superelevation and tend to depress the inner or low rail of the curve. This necessitates frequent readjustments to eliminate the increased superelevation thus obtained. This is usually accomplished by raising the low rail of the curve to the original elevation. When this rail has been raised an inch or two, cavities are formed under the ties which extend continuously in diminishing area to a point near the opposite ends of the ties on the high side of the curve. Under such conditions the entire cavity under the ties should be filled with ballast in order to obtain full support and preserve the subgrade.

The entire track construction is an assemblage of integral units, each performing its individual function, but dependent also upon the proper functioning of all other units. The rails support the wheel loads, receive the impact and transmit the shock to the ties, which in turn distribute the thrusts to the supporting stratum of ballast, whence it is distributed to the subgrade and wholly absorbed. Thus, the subgrade is the supporting foundation for all. Without adequate support by the subgrade, the entire assemblage is unable to function properly and will ultimately fail of the intended purpose. When the subgrade is rendered non-supporting, the ballast can furnish only diminished support to the ties, the rails are then deprived of sufficient support to withstand the wheel loads, and the result is the distortion of the entire track structure.

Improper Loading of a Caterpillar Crane Resulted in the Wrecking of Two 120-ft. Bridge Spans

Better Insulation Keeps Out the Cold

Improved building construction on the Canadian National has reduced the coal bill and provided greater comfort for the employees

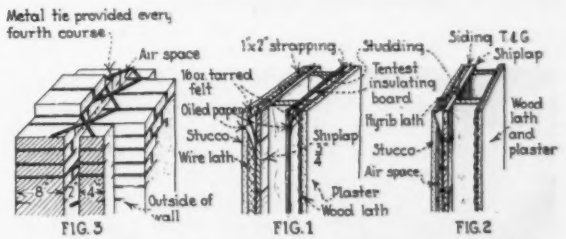
THE VALUE of high-grade insulation in the walls and roofs or ceilings of buildings, as a means of reducing the cost of heating them, is now more generally appreciated than it was in the past. This is due in no small measure to the promotional work of the manufacturers of insulating materials, but in parts of North America subjected to long, cold winters and periods of extreme low temperatures, attention to the proper insulation of buildings has been a matter of necessity, not only for the purpose of conserving fuel, but to insure adequate comfort to the occupants of the buildings. The Canadian National, Western region, for example, has given this problem most careful study and has not only provided improved insulation in its newer buildings, but has also found that there is economy in remodeling old structures to increase their ability to hold the heat generated by the fuel used to warm them.

Details of the Insulation

In the drawing, Fig. 1 shows the current standard wall construction for frame stations and dwellings. The studding is sheathed on the inside with a heavy wall board and on the outside with ¾-in. shiplap, which are each in turn covered with 16-oz. tarred paper and a layer of oiled paper. One-inch by two-inch strapping is nailed against both these inside and outside surfaces in line with the studding to serve as nailing strips for wood lath and plaster on the inside of the building and for metal lath and stucco on the outside. Thus, in addition to the effect of the insulating materials and the three separate dead-air spaces, two layers of paper are provided to stop air leakage. The ceilings next to roofs are insulated by three inches of Insulex. Storm windows and doors are also provided. This form of construction has been effective in saving one-third of the fuel required for heating as compared with that consumed in buildings of the older forms of construction and for the same reason insures a greater degree of comfort for the occupants.

Also Improve Older Buildings

The older structures of this class on the Canadian National had walls in which ¾-in. shiplap and ¾-in. T & G siding covered the studding on the outside, with a layer of building paper between the shiplap and the siding. They were covered on the inside with either plaster or V-ceiling. The heat-retaining qualities of buildings of this type have been greatly improved by giving them a stucco treatment. The siding on the outside, as shown in Fig. 2, is covered with Hyrib lath to which the stucco is applied, the effect of the lath being to place the stucco covering well away from the old siding and thus form an additional air space. It is said that the consumption



Sketches Illustrating the Methods of Insulating

of coal for heating buildings on the Canadian National, Western lines, has not increased in seven years, in spite of the construction of scores of new buildings each year during that time. This reduction in consumption has been ascribed primarily to the improvement in insulation.

Considerable study has also been directed to the improved insulation of roundhouses and shop buildings, particularly the former, because cold walls and ceilings in roundhouses, with their steam-laden atmosphere, cause rapid condensation which results in highly objectionable dripping in the case of roofs. Furthermore, the constant damp condition of roundhouse roofs has been responsible for their rapid deterioration. These objectionable conditions have been overcome in the newer roundhouses by improved wall and roof construction. The brick walls of roundhouses, as shown in Fig. 3, have been constructed so as to provide a dead air space. An inner eight-inch wall is provided to meet the structural requirements and to insure adequate support for jib cranes, line shafting or any other equipment that may be installed on the walls by the mechanical department forces. On the outside and separated from the eight-inch wall by a two-inch air space, there is a four-inch wall, the two being connected structurally by expanded metal ties inserted at every fouth course of brick. This construction affords an uninterrupted air space in the wall construction that has proved effective as an insulation and has greatly reduced condensation on the interior surface.

Insulating Roundhouse Roofs

The roofs of roundhouses are also being constructed in accordance with a design that provides improved insulating properties (Fig. 4). The primary structural feature of the roof is three-inch T & G planking supported on the purlins, this planking being covered in turn by 16-oz. felt, a course of "ten-test" board and a second layer of 16-oz. felt. On top of this construction and separated from it by means of 1-in. by 3-in. wooden strapping is a second covering of 1⅛-in. T & G planking which is, in turn, covered by 16-oz. felt, oiled paper and five-ply tar and gravel roofing.

Based on the experience with roundhouses equipped with the new form of insulated roof, it is estimated that this roof construction is responsible for a marked saving of fuel used for heating. In one roundhouse alone, after it had been rebuilt as above, the saving of fuel in the first season after completion was over $3,000 as compared with the previous season, although weather conditions were more severe when the house was completed than in the previous year.

In addition to the practical elimination of condensation and the economies in fuel effected by the greater attention to insulation, it has been found that the atmospheric conditions in these roundhouses are far superior to those in buildings provided with less effective insulation. Instead of the foggy condition experienced where the insulation is not effective, the air in these new roundhouses is relatively clear, even in the coldest weather.

We are indebted for the above information to G. C. Briggs, engineer of buildings, Canadian National, Western region.

Many Fissures Found in Rail After Twenty Months' Service

THE derailment of a passenger train on the Southern near Shannon, Ga., on July 18 as the result of a transverse fissure, led to an investigation by the Bureau of Safety of the Interstate Commerce Commission which disclosed an unusual condition as to transverse-fissure rail failures. The rail in this track was of 85-lb. pattern in 39-ft. lengths rolled in 1926 and in a period of 20 months about 40 or 50 broken rails had been found on the division on which the accident occurred, although none was of the same heat number as the one involved in the accident. The line is equipped with automatic block signals and the presence of several transverse fissures had previously been disclosed by signal indication.

Fragments of the rail involved in the accident were examined by James E. Howard, engineer-physicist of the Bureau of Safety who discovered no facts that would indicate any unusual condition of the rail or the metal which composed it. "The present rail presents no features that have not been met in other examples," he stated in his conclusions, "but its display of transverse fissures at the early age of one year and eight months is disquieting."

New York Central's "Twentieth Century Limited" Leaving Chicago

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE SEPTEMBER ISSUE

1. *What can be done to retard or prevent a heavy growth of weeds on the right of way?*

2. *What is the best method of testing the bearing power of soil to determine the allowable pressure per square foot.*

3. *When relay rail is installed on secondary lines, is it good practice to use the turnouts released with the rail or should new turnouts be furnished?*

4. *Should bridge inspectors be selected from the division bridge gangs or is technical training a requisite for this position?*

5. *When track is being reballasted, should it be filled and dressed as soon as the final lift is completed or should it be left open a few days to expedite the picking up of slack places?*

6. *What tools and other equipment should be provided in water stations operated by gasoline or oil engines or by electric motors?*

7. *When work is being done by extra gangs what, if any, advantages are gained by providing tool boxes so that the tools may be left at the site of the work overnight?*

8. *What details should be given particular attention in the inspection of buildings?*

Canting Rails Through Turnouts

Where it is the practice to cant the rails in main tracks, what are the advantages and disadvantages of canting them throughout turnouts?

No Economy in Canting Rails Through Turnouts

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

For many years while timber and labor were cheap, rails were laid directly on the crossties and were canted inward by adzing the ties. Many of the older track men of today remember when a good job of rail laying required the rails to be so placed that the bearing of the wheels on the rails was clearly shown by the bright streak worn along the center of the face of the rails by the wheels of the first trains passing over them.

When the frog was reached the rails stood vertically because the intersecting rails were bolted together and rested on straight flat plates, this being taken as a matter of course. When split switches came into use the points necessarily had to be carried on riser plates, and again, as a matter of course, the stock rail and switch point also stood vertically. Perhaps they wore out a little faster than did the canted rails, but it was never considered necessary to adopt special construction to avoid the difference in wear.

Evolution, in its quiet way, brought about the use of tie plates for the protection of the ties from rail cutting. The earlier types were flat topped, rectangular in shape and symmetrical in dimensions and punching; there was no outside and inside to the tie plates, therefore there was no canting of the rail by means of the tie plates, but the canting of the rail by adzing of the ties continued until the use of preservative treatments, for prolonging the life of the ties, was adopted. It soon became evident that the adzing of treated ties caused serious damage, resulting in throwing away a large part of the value of the preservative treatment, and orders forbidding the adzing of treated ties naturally followed. The result, of course, was the laying of rails vertically, which, in turn, brought about the rolling over of a bead along the edge of the face of the rail, and the wearing of the inner side of the head of the rail thinner than the outside, with consequent detriment to the rails. When sufficient time had elapsed to allow these defects to become apparent, maintenance of way forces recognized the need of restoring the cant to the rails, and the natural result was the adoption of a tie plate thicker at the shoulder than at the inside of the rail seat.

But tie plates are not used where switch slide plates and frog plates are used, therefore we are again back to the old practice of canting the running rails inward except at the switches and frogs. On first thought it appears that would be very easy to carry the cant through the stock rails and switch points by the simple expedient of making the switch slide plates to the same pitch, or cant, as it used on the tie plates, but when the heel of the switch point is reached it becomes necessary to use tie plates on the next tie, and since the next tie is a switch tie of uniform surface, the running rail would be found a little higher than the switch rail, and consequently the running rail would have to be shimmed up or the tie adzed down for the switch rail.

At the frog, we again meet with difficulty since the two rails which meet and cross each other in the frog, if canted, must cant in opposite directions. This would require special frog construction and would tend to make a high point for the false flange of worn wheels to cross when passing over the other rail which joins to make the frog. The frog and switch points of a

turnout usually wear out for other reasons before the lack of cant in the rails composing them causes any considerable wear, therefore it is not worth while to go to the extra expense and trouble of providing for the cant of the rails of the frog and the switch points and that part of the stock rails which is carried on the switch slide plates.

No dangerous conditions result from leaving the running rails vertical at the switch point and frog and the only detrimental feature accruing is the eccentric wearing of the rails just as it occurs on vertical rails away from the switches. The canting of the rails is desirable as a means of preventing this eccentric wear and, where it can be done conveniently, it is good practice, but the special construction necessary to cant the rails through the frogs and switch points would cost more than the saving in the wear of the rails at those points would justify.

Roofing for Roundhouses

What are the relative merits of the various types of roofing materials for roundhouses, from the standpoint of maintenance?

Merits of Two Types Compared

By A. L. Sparks

Architect, Missouri-Kansas-Texas, St. Louis, Mo.

Roundhouses are generally roofed with one of two types of roofing, pitch and gravel, or asphalt and felt. Both these roofs have commendable qualities and give good service with reasonable maintenance. The better quality of pitch and gravel roof is generally applied at slightly greater cost than the asphalt and felt. It also imposes a greater dead load on the structural framing, but can be laid with less slope.

Many office buildings and other expensive buildings with perfectly flat roofs are roofed with pitch and gravel, carrying bonded guarantees for 20 years' service. Old roofs of this type are comparatively easy to repair and sometimes several years' additional service can be had by raking off the gravel, mopping on an additional layer of felt and pitch and re-applying the gravel. Such repairs can be made by division forces, but special equipment for heating the pitch is required. When the gravel is re-applied evenly there is little indication of repairs having been made and the roof presents a uniform and even appearance.

Asphalt and felt roofs are often laid with asbestos felt which serves as insulation, keeping out some of the sun's heat and also offering somewhat better fire protection. Rag felts and other cheaper felts are also used in the construction of this type of roof and make good coverings of light weight capable of being laid on roofs of slopes up to 45 deg. When carefully laid they present a smooth, even surface on which leaks are, as a rule, easily detected and repaired by small patches. Such repairs are generally made with an asphaltic coating containing some fibre. The coating can be purchased in either small or large containers which are easy to handle.

One commendable feature of this type of roof is the fact that repairs can be made by one man who can carry the necessary repairs with him, thereby saving considerable time and expense in transporting equipment. The patches on such roofs are plainly seen and are sometimes objectionable on buildings other than roundhouses. The felts on this type of roof dry out more rapidly than on a pitch and gravel roof unless they are coated every two or three years with an asphalt coating. When properly painted, the life is greatly lengthened and the appearance is also much improved. This type of roof requires slightly more attention than pitch and gravel and should be given careful and systematic inspection to insure the best results.

Tar and Gravel Roofs Are Preferred

By P. Aagaard

General Building Inspector, Illinois Central, Chicago

Tar products roofing, if of the proper quality and used in sufficient amounts, makes one of the best roofs for roundhouses, when properly applied. The flashing on the fire walls should be protected with one ply of ready roofing to afford the same protection to the fire walls as is given to the body of the roof with the gravel. A roof of this character will last its guarantee period of 10 years and, with a recoating, 5 years more. In most cases after that time the roof boards will start to disintegrate, especially if poor material was used, and it will be necessary to renew a portion of the boards, and, of course, the roof covering.

I do not doubt but that equally good results can be obtained by the use of asphalt products roofing, provided the same care is used in its application and that the roofing is covered with gravel the same as the tar-products roof. This is necessary to weight the roofing down. Experience has shown that the roof boards shrink and that heavy winds through open doors and windows have a tendency to lift the roofing where such shrinkage has taken place, if the roofing has not been covered with gravel.

Joints Ahead of Turnouts

What advantages, if any, are gained by using even joints ahead of turnouts in tracks where the joints are normally staggered?

Use Even Joints Ahead of All Turnouts

By J. J. Desmond

Roadmaster, Illinois Central, Chicago

There are no disadvantages in using even joints ahead of turnouts, while there are several advantages in doing so. Our standard plans for main-track turnouts call for even joints ahead of the switch points in all cases. The advantage of this arrangement is the fact that it permits the installation of the points so that no joints will be located in either the main rail or the stock rail between the point and heel of switch, and also avoids, in many cases, the short stagger that would be necessary if an attempt were made to preserve the stagger. This arrangement also works out nicely for the location of insulated joints at the turnout in track circuits where it is desired to place such joints ahead of the turnouts.

Even Joints Are Preferred

By H. R. Clarke

General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

We make it a practice to use even joints ahead of the switch points in all our main tracks where the joints are normally staggered in order to keep the joints in the main rail beyond the limits of the switch point, thus enabling us to use the full angle bars instead of having to plane off the flange of the inner bar as would be necessary if the joint in the main rail came between the point and heel of switch.

A complete bill of material is furnished for our new turnouts including the stock rail and the closure rails.

The bend of the stock rail is placed about six feet back of the toe and this insures that the heel will fall well beyond the heel of switch, even with the long switch points used with our No. 15 and No. 20 turnouts. After the heel of frog is passed the regular stagger of the joints in the main track is re-established. Another advantage gained by this practice is the simplification of installing insulated joints ahead of the turnout in track-circuit territory. This is not a controlling factor in the use of even joints at such locations, but is an added advantage.

Tests for Concrete Aggregates

What practical field tests can be made to ascertain if stone or other coarse aggregates are suitable for concrete?

Field Tests Should Be Used Cautiously

By G. A. Haggander

Engineer Maintenance of Way, Chicago, Burlington & Quincy,

The principal tests which can be made to determine the suitability of stone for concrete is an examination to see that the stone is sound and does not break into flat thin pieces when fractured. Shale is sometimes hard to distinguish from limestone and any seams on strata in a limestone deposit which are not clearly limestone should be discarded until their true nature can be verified. When gravel is to be used, the pebbles should be examined to see that they are hard and dense, and are not coated with foreign matter.

With either stone or gravel, the porosity of the materials should be ascertained in a general way, and if they are very porous, they should not be used, since they will absorb water rapidly before the concrete has set, thus injuring it, and will also be apt to cause trouble in freezing weather.

It is our practice, in general, to use gravel from our own pits which has been tested and known to be suitable for concrete. If, for any reason, it is desired to use materials from other sources, whose qualities are unknown, samples are sent in so that the proper tests can be made where the facilities for this work are better than they are in the field, and untested materials of local origin are used only in minor or unimportant work.

Tests Vary With the Kinds of Material

By G. W. Ward

Petrographer, Portland Cement Association, Chicago

Indications of a particular rock's durability may be obtained from an examination of the quarry or the stock pile. Estimate the amount of weathered rock debris at the foot of the quarry face or the amount of disintegrated material in the stock pile, comparing these findings with the length of time exposed, severity of weathering and with other aggregates, the sources of supply of which are known to be good.

Examine the aggregate's crystal texture, structural features and take into consideration the following:

Igneous rocks such as granites, gabbros and diabases are the most durable concrete aggregates. The denser the igneous rock or the finer the crystal texture the better the aggregate. The coarse-grained rocks are harder, but on account of their larger crystals break more readily under impact. Rocks showing weathering or alteration should not be used without a petrographic investigation. Such rocks are detected in the field by a softening of the micas, a powdery or dusty appearance possessed by the felspars and other characteristics of decomposition. Of the sedimentary rocks, those that possess bedding laminations, clay, or sulfides do not make good aggregate. Limestones having a smooth conchoidal fracture and low porosity make the best aggregate from the standpoint of durability. Sandstones and conglomerates must be examined as to cementing material. If the sand grains or the gravel pebbles are imperfectly bound together, the strength of the rock is impaired and therefore it will be less durable in concrete.

Metamorphic rocks, that is, those which have flowed and recrystallized under pressure and heat, unless they crush into angular fragments or are dense, fine-grained and of low porosity, are to be avoided. Cleavable slates and shales should not be used as concrete aggregate.

Coarse aggregates which meet the requirements for durability will, in general, be found satisfactory as to their strength and wearing qualities when used in concrete.

There are no standard field tests to determine the suitability of coarse aggregates for concrete as regards durability. In the laboratory, petrographic investigations can be made, also sodium-sulfate tests and freezing and thawing tests, but none of these tests can be adapted to field work. The sodium-sulfate test, which is considered to be accelerated freezing and thawing, is still in an experimental state and its relation to durability has not been established for all cases.

Adzing Ahead of Rail Laying

To what extent is it economical to adze the ties in advance of rail relaying operations?

All That Can Be Done Without Removing Rails

By J. W. Powers

Supervisor of Track, New York Central, Rochester, N. Y.

The adzing of ties, as I interpret the question, refers only to the scoring of the ties as it certainly would be neither economical nor practical to remove old rail and tie plates for the purpose of adzing them to give the new rail a uniform bearing except at the time the new rail is installed.

However, I do not know of any reason why any restrictions should be placed on the amount of scoring that should be done in advance of rail-laying operations except that it frequently happens where rail laying is done without interruption to traffic that the men have considerable time which they could devote to scoring and other work while waiting for trains.

Much better results can be obtained by the use of saws which are now on the market for scoring ties for new rail than by using adzes for scoring.

Should Be Done if Ties Are Badly Rail Cut

By Roadmaster

Ordinarily there is little economy in adzing ties in advance of rail-laying operations unless they are badly rail cut, involving heavy adzing work. In such cases, the advance adzing will usually permit faster progress in rail laying than if the rail gang must do all the adzing and, in addition, it insures a better job, since there is not the hurry that characterizes this work in rail-cut ties by the rail-laying gang. Of course, a complete job of adzing cannot be made until the rail has been removed, but enough can be done so that the rail gang will have only a little smoothing up to do before the new rail is installed.

Advance adzing is particularly helpful where rail is to be laid during the winter months, since the work can be done better in the fall, before cold weather, than it can after the fibers of the wood have become frozen and the ties have become coated with snow and ice. Better results are obtained in winter rail-laying when the old rail has been gaged before the new rail is laid, and when this is done the advance adzing should be carried on at the same time.

Silting of Reservoirs

What can be done to retard or prevent the silting of reservoirs? What is the best method of removing silt after it has been deposited to such an extent as to reduce the capacity of the reservoir seriously?

Little Can Be Done Effectively

By P. M. LABACH
Engineer Water Service, Chicago, Rock Island & Pacific, Chicago

There is little that can be done effectively, either to prevent the silting up of reservoirs where the water carries a large amount of suspended matter, or to remove the deposit after it has reduced the capacity of the reservoir to a serious extent. Contrary to a widespread opinion, the silting begins as soon as the flow of water is checked on reaching the water in the reservoir and progresses from that point to the dam. For this reason, sluice gates in the dam do little good, for their influence extends only a small distance from the dam.

Some relief can be obtained by installing a gate in the dam and opening it at intervals to wash out some of the deposit, but here again the influence is confined to a small area, since the tendency of the flow of the water is simply to cut a ditch in the silt and to remove only a small amount of the deposit. With earth dams, the dam can be cut to serve the same purpose, and to permit successive freshets to wash out some of the silt. While this practice will afford temporary relief, the amount of silt removed by this method is small, since the material so deposited is in a finely divided state and becomes quite hard on exposure to the air.

Removal of the deposit by mechanical means, as by hydraulic dredging or by sluicing with high-pressure pumps is very expensive, owing to the cost of installing the necessary facilities. When a reservoir becomes so badly silted that its capacity is reduced seriously, it is usually cheaper to install a new dam either above or below the former site.

Stop Erosion of Soil on the Water Shed

By C. R. KNOWLES
Superintendent Water Service, Illinois Central, Chicago

There are two causes for the silting of reservoirs, first, organic growth from the water, and second, soil or silt washed in by the water. The latter is the principal cause of deposits.

The silting up of reservoirs is a serious problem in some sections of the country, particularly where the soil is easily eroded by the water. Provision is frequently made for the deposition of silt in reservoirs below the point of intake or suction line. A large number of railroad reservoirs have been in service for many years without any appreciable reduction in available capacity due to silting. The silting up of reservoirs can be prevented to a very large extent by preventing the cultivation of the water shed to or near the water's edge, and wherever possible, the bank of the reservoir should not be disturbed by cultivation for a distance of from 200 to 400 ft. This area should be planted in grass or other similar vegetation which will arrest the silt. Ravines or gullies on the reservoir site should be filled or protected in such a manner as to prevent their erosion. Where severe erosion occurs in creeks or other streams tributary to the reservoir it may be advisable to construct a small dam which will permit the deposition of a large portion of the silt above the reservoir. The amount of sedimentation that may be deposited in a reservoir can usually be determined by an analysis of the water from the streams and water sheds, and some allowance should be made for reduction in capacity through silting.

A certain amount of silt can be removed from reservoirs by means of sluice gates or outlet pipes located in the bottom of the reservoir. The area over which the sediment can be removed is limited except where the bottom of the reservoir is narrow. Even then, it may be necessary to provide several openings over the bottom. The removal of silt by sluicing is unsatisfactory even under the most favorable circumstances, particularly in large reservoirs, as the greater portion of the silt is dropped beyond the influence of the sluice gates and the greater part of the material will have to be taken out by methods similar to those used in ordinary excavation, as for example with clam shells, drag-line buckets and dredges. Where conditions are favorable, a dredge pump may be used to remove the silt. This, however, is very expensive and is practicable only on very large reservoirs where the amount of material to be removed would justify the initial expense for equipment and also for the reason that the operation causes the water to become very muddy, particularly where the water used in excavation is returned to the reservoir.

The Prevention of Gullies

What is the best method of preventing the formation of gullies in ditches or other waterways on the right of way where the soil washes easily?

Several Methods May Be Used

By A. CHINN
Engineer Maintenance of Way, Chicago, Burlington & Quincy, Lincoln, Neb.

The formation of gullies in ditches and waterways can be prevented in several ways. The best method will depend on local conditions and the available supply of material. All methods depend on the same principles, those of retarding the flow of the water until it will not wash, or providing a bed for the waterway that cannot be scoured.

If the waterway is fairly large and the scouring heavy a good method is to place willow or brush mats at intervals, depending on the gradient, and pave the surface of the mats with one-man riprap. Care must be exercised in placing the mats to see that no openings are permitted to remain underneath or on the sides for the water to pass through and start a new scouring action. If the mats are properly placed, the ditch will soon fill to the level of the paving and further washing will be stopped. If willows or brush are not available, small trees can be used, anchoring them with the butt ends up stream and filling between them with riprap.

Dikes built of stone are also successful. The stone must be carefully placed to provide a smooth waterway with a concave contour so that the current of the water will be held toward the center. The downstream face

must have a flat angle and the toe well buried so it cannot wash away. To avoid using a great deal of material and labor, it is necessary to build to a height of only two or three feet at a time, and as the ditch fills in above the dike, sections should be added until the desired height is reached.

Where the waterway is not large and the scouring light, most any device that will slow up the current will usually serve the purpose. Old ties set as posts or brush thrown in loosely are sufficient as a rule. A few sections of hog tight fence set in the ditch have been found to be very effective. In cases of this kind the necessity of preserving appearances usually decides the method to be followed.

Protect Slopes of Cuts and Embankments

By G. Stafford

Section Foreman, Canadian National, Rosebud, Alta.

Any reasonable expenditure which reduces the washing or erosion of the slope is well made. In the case of high banks in a cut or the slopes of a fill, where the soil is loose and sandy, even a small amount of water is likely to cause considerable damage and, if the condition is not remedied, will extend rapidly back into the embankment itself and assume the proportions of a menace. Covering the slope with sod or other vegetation of quick growth, and with fibrous roots that will knit together the particles, will give good results. The writer has in mind the practice on some European roads, where the work is to be of a lasting character, of excavating a series of shallow trenches down the sides of the bank in the form of a "Y." These extend the whole length of the slope with the upper extremities of each "Y" practically adjoining. In some cases these gutters or trenches are paved with flat stones or cobbles and sometimes concreted, and have the advantage that they are easily maintained and flush themselves during heavy rains.

To my mind, the most serious form of gullying is that which is met with at bridge ends abutting in cuts. My present section is situated in hilly country, where a watercourse is spanned by 14 trestles of considerable height and length, the bridge approaches lending themselves to the general contours of the surface formation; that is, one bridge end abuts in a cut and the other end is approached on a fill. The gullying condition is present in every case, to a greater or less extent, where the bridge approach enters the cut, resulting in a weakening of the roadbed and the constant washing away of the ballast. In an effort to combat this condition, the gully, in one case, has been converted into a blind drain; that is, a quantity of field stones was obtained and the larger ones placed in the bottom and tamped down, the smaller stones being placed at the top. In another instance an auxiliary gutter has been dug, leading away from the surface ditch as it approaches the bridge-end, and the excavated material used to fill up the gully. The advent of the rainy season will prove the worth of these preventive measures. Should it be desired to make the work of a more permanent character and the necessary material is available, the writer is of the opinion that a 12-ft. section of second-hand culvert pipe of about 12-in. diameter, laid at a fairly steep grade in the bed of the gully, and projecting from the slope in order to give free vent to the water, would be more satisfactory than the methods outlined above. A blind drain is objectionable in any case and is only suitable where the amount of water is small, since it silts up quickly.

With respect to gullying in ditches, the section of the ditch has much to do with this condition. It is found in practice that a ditch of wide and flat cross-section does not gully so readily as a ditch of "V"-shaped and trapezoidal section. Ditches of the latter construction will naturally carry more water, and, if they are preferred to those of wide and flat construction, gullying may be prevented by paving the ditch with field or cobblestones.

All ditches must be given outlets at frequent intervals, otherwise the amount of water will become so great that it will exceed the capacity of the ditch, when gullying will result. In addition, if the water is turned off frequently into adjacent fields, property owners in the vicinity will not raise the same objection as if a large amount were disposed of in this manner.

Chamfering Treated Piles

What benefits are gained from chamfering the tops of treated piles in trestle bridges? Are these sufficient to counter-balance the damage to the timber caused by this practice?

Treated Piles Should Not Be Chamfered

By C. S. Heritage

Bridge Engineer, Kansas City Southern, Kansas City, Mo.

Structurally, there is no benefit in chamfering the tops of the piles, but it undoubtedly does give the work a somewhat neater appearance, and when untreated timber was used for trestle construction it was the general practice to chamfer the tops of the piles where they projected beyond the edges of the caps.

When treated piling came into use, it was found that rot started much quicker at the points where the piles were chamfered than at any other place; therefore, the practice of chamfering treated piles has been largely, if not entirely, discontinued. We believe that the best practice is to cut the piles off square and protect the tops where they are cut off by treating with creosote oil and adding roofing material to keep the water out of the tops of the piles. I feel that protection of the piles is of much more importance than the slightly neater appearance of the chamfered piles.

Chamfering Causes Serious Injury

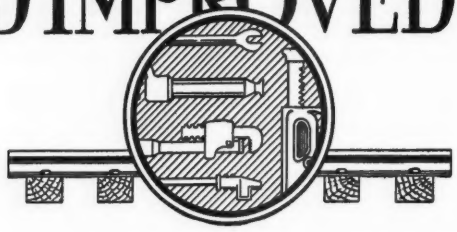
By I. L. Simmons

Bridge Engineer, Chicago, Rock Island & Pacific, Chicago

There are no advantages to be gained by chamfering treated piles in trestle bridges, while there is a serious disadvantage in the injury to the wood resulting from this practice, since it cuts away a portion of the wood containing the greatest amount of the preservative, exposing the more lightly treated wood to decay. The injury is often accelerated by the checking of the chamfered surface, which facilitates the entrance of water to the inner fibers.

It is the general practice to chamfer untreated piles and in such cases it is of advantage, since the sloping surface allows water reaching the top of the pile to drain away, and also provides a somewhat better appearance. With untreated piles, the decay of the outer portion, or the sap wood, is not of major importance, since the life of the pile is dependent on the length of time the heart wood is able to resist decay. With treated piles, on the other hand, the sap wood, being of greater porosity than the heart wood, is the portion which is susceptible of absorbing and retaining the greatest amount of the treatment, and which acts as a protecting sheath or envelope for the entire pile.

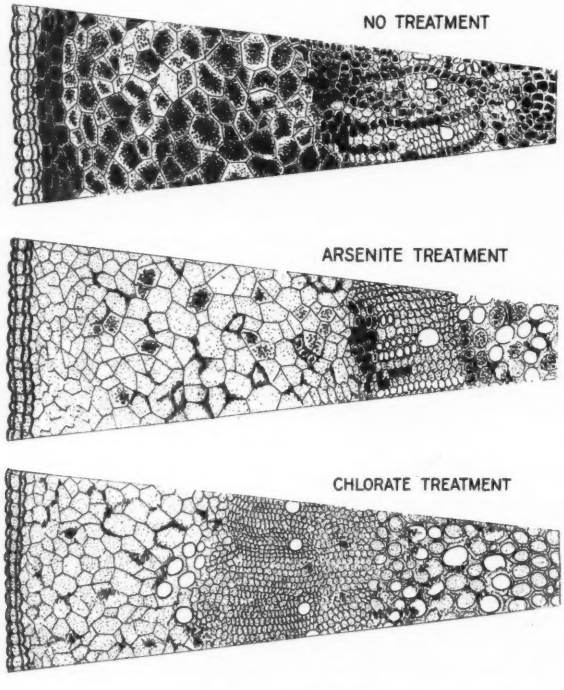
NEW AND IMPROVED DEVICES



Use of Nonpoisonous Weed Killer Is Growing

PATENTS covering the making of calcium chlorate, its use as a weed killer, its adjustment to obtain the maximum weed-killing effect and its use in dry form as a duster, have been issued to the Chipman Chemical Engineering Company of Bound Brook, N. J. This legal recognition of calcium chlorate as a proprietary compound has come after five years of development in the use of this weed killer, which is now being manufactured and sold under the trade name of Atlacide.

Because it is nonpoisonous, its use has not only increased greatly on the railroads during this period, but



How Chemicals Kill Weeds

The three views show sections of weed roots drawn from microscopic examinations, the starches being indicated by black spots. Note the almost entire absence of the spots in the section of a root after chlorate treatment.

its introduction last year in dry form for dusting has kindled a wide interest in its use for the control of weeds in agriculture. The agricultural schools of various states are conducting experiments with it and the agricultural train, to be operated by the Michigan Central during the coming summer, will include an educational exhibit devoted to its use. However, the claims for the advantages of Atlacide made by the manufacturer are not confined to its nonpoisonous nature, for it is said to be effective in the killing of weeds which have proved particularly resistant to the commonly used sodium arsenite. This claim is borne out by the fact that one road recently purchased 20,000 lb. of dry calcium chlorate for the eradication of bindweed or wild morning glory, as it is known in some localities, to prevent its spread from the right-of-way to adjacent fields.

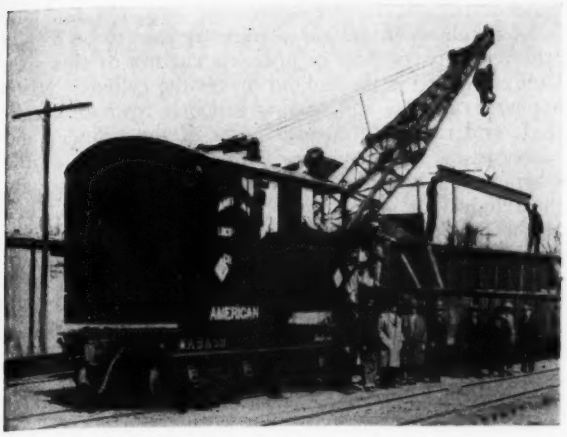
The effectiveness of a chlorate compound in weed killing is due to the fact that it upsets the equilibrium of the sap, causing starvation, and also interferes with the action of the chlorophyll, or green substance of the leaves. The action of arsenic is caustic, destroying plant life by "burning" the plant tissue. This difference in action is offered by the manufacturer of Atlacide as an explanation for its greater effectiveness in destroying plants having long underground stems, and is illustrated by the drawings of enlarged sections of plant roots, made by the Kansas agricultural experiment station, in which the stored starches or plant food is indicated by black spots. It will be noted that the destruction of the plant food is complete only in the root of the plant treated with chlorate. The use in the dry form greatly adds to its convenience in handling and transportation. Five pounds of Atlacide calcium chlorate, when applied dry, has the effectiveness of 45 to 60 lb. of spray solution.

A Gasoline Crane With a Three-Speed Automotive Shift

THE American Hoist & Derrick Company, St. Paul, Minn., has developed a gasoline-operated locomotive crane equipped with a new three-speed automotive transmission. The object of this improvement is to give a degree of flexibility in operation which is said to be equal to that of a steam crane. Thus, the low gear is normally used for a powerful start, the intermediate for average crane work and traveling, and the high gear for rapid traveling. Varying speeds also facilitate material handling, for a light load can be handled with speed, while a heavy load can be moved slower and with more power.

The four-cylinder motor is bolted into the revolving deck casting, while directly in front of the engine and connected to the power take-off of the engine, there is a flexible coupling which connects with the transmission case. The transmission is operated with a foot clutch and an automotive gear-shift lever, like those on an automobile. All transmission and bevel gears connecting with the drive shaft are enclosed in a single oil-tight case. The lever system has been redesigned for easy operation and the lever stand has been moved forward to the front right-hand corner of the deck to give the operator a clear view of the work.

These gasoline three-speed cranes can be supplied in any capacity from 12 to 30 tons. With the exception of the three-speed automotive gearshift arrangement



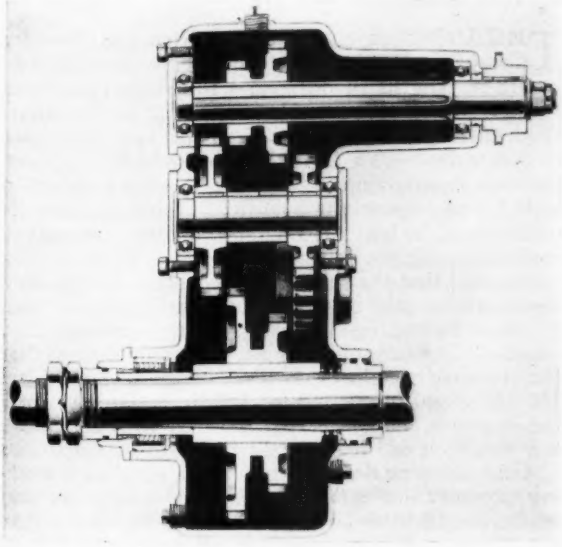
The New Gear-Shift Gasoline Crane

they follow the usual "American" crane design, although, as stated above, the entire crane has been redesigned for gasoline gear-shift operation. The ratings of all "American" gasoline three-speed cranes are based on their capacity on the intermediate gear.

New Fairmont Reversible Motor Car Transmission

AN ADVANCED type of gear transmission for motor cars has been developed and placed on the market by Fairmont Railway Motors, Inc., Fairmont, Minn., which provides two speeds, with a reverse lever which is operable for either speed.

As will be seen by the accompanying sectional view, only five gears are used, the shifting of the upper spool changing speed while reversing in either speed is accomplished by shifting the lower spool. All gears are of hardened cut steel, running on ball or roller bearings and the splined shaft and the splined axle sleeve are hardened. The gear case is of aluminum with "Ring-seald" piston-ring packing on all shafts, making the case oil tight and grit proof. All wearing parts run in an oil bath.



Sectional View of New Fairmont Reversible Motor Car Transmission

Power is transmitted from the engine to the gear set by a Fairmont endless cord belt, which it is said will not stretch in service, and which also serves to cushion the gear shifting. This gear arrangement is said to have the advantage of confining all speed-reduction stresses within itself, so that there is no excessive pressure on the engine crank-shaft bearings or frame.

A New Method of Surfacing Track

WHAT IS probably the most unique development in equipment designed for surfacing track is a device which blows the ballast under the ties. This machine had its inception in the fact that sand or other granular material containing appreciable amounts of fine particles is in its most compact form when washed into place or deposited by water. Experiments showed that corresponding results could be obtained by a stream of air of suitable volume and velocity.

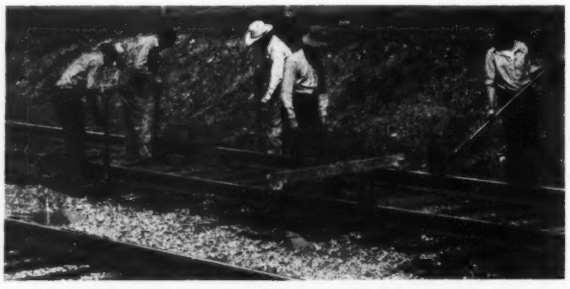
The tamping tool that was developed as the result of

Power Unit with Three Wolfe Tampers

these experiments is the Wolfe Tie Tamper, manufactured by the Wolfe Tamper Company, Richmond, Ind. It consists of a hollow steel casting having a shape similar to a narrow spade with a wooden handle. A hose attachment provides a supply of air which passes out through a 7/16-in. slit or orifice three inches wide in the side of the blade close to the bottom. An integrally-cast bracket on the rear side of the tool provides a convenient step for forcing the blade down into the ballast, the object being to introduce the tool far enough so that the orifice will reach a point slightly below the bottom of the tie, when the current of air will blow the particles of ballast into the tie bed.

Extended experiments were made to determine the correct shape of the orifice and the necessary air pressure to get the required result and it was found that the best effect was obtained with a relatively narrow slit—about 7/16 in. and with an air pressure of not more than 7 lb. per sq. in. It was also found that a tool inserted on one side of the tie just outside the rail would effectively tamp the tie under the rail and to the end without tamping from the other side at all. It is necessary, however, to use the tool inside of the rail, but to a lesser extent. This has resulted in developing a three-tamper outfit, as a man with a tool working inside can readily keep up with two men working outside the rails at each end of the tie. The power unit is an Acme positive blower, driven by a LeRoi gasoline engine and delivering 144 cu. ft. of air per min. at a pressure of 7 lb.

After a trial use of one of these tool outfits on one railroad in the Middle West, four others were placed in service and used throughout a large part of last summer, so that records of performance on work by gangs of five or nine men were obtained between April 16 and



Small Track Gang Using Wolfe Tampers

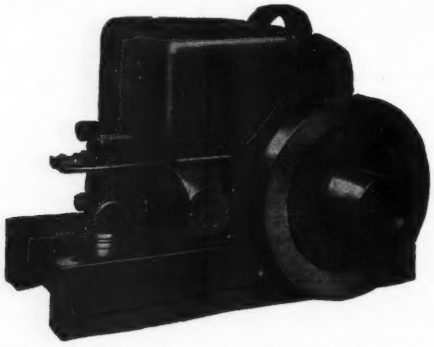
October 26. These show that the average number of lineal track feet tamped per machine hour with lifts ranging from 2 to 3 in. varied from 124 to 276.5 ft. and that the output per man hour was from 13.1 to 23 ft.

The manufacturers of this device call attention to the fact that its use is necessarily confined to gravel, cinders, chats or other "granular" ballast.

New Portable Engine Has Many Interesting Features

A NEW line of general utility gasoline-kerosene engines in ratings from 1½ to 7½ hp. recently introduced by Fairbanks, Morse & Co., Chicago, incorporates a number of interesting features. While the most radical departure from previous construction is in the all-enclosed, self-oiling feature, the new engine is quite different in appearance from other small engines of its type.

The unit of 1½ hp. rating, which is a size used in a wide diversity of purposes, such as the driving of portable pumps, air compressors, generators, saws,



The 1½ hp. Unit Is Only 19 in. Wide and 22 in. Long

grinders, etc., is the most interesting development in the new line. It is less than 16 in. high, 22 in. long and 19 in. wide and weighs 150 lb.

Two pulleys are provided, one of which operates at the engine speed of 1,500 r.p.m. and the other at 750 r.p.m. There is also a mechanical regulator which permits slowing the engine down to 1,100 r.p.m. with, of course, a proportionate reduction in horsepower. With the two pulley speeds and the speed regulator it is said that it is possible to meet the requirements of almost any type of drive.

An important feature about the new 1½ hp. unit is its simplicity in design. There are said to be 25 per cent fewer parts than in previous engines of this size. Unit construction throughout makes the cylinder, water hopper, crankcase and bearing supports for both crankshaft and camshaft integral parts of the cylinder and base casting. The engine, with the exception of the magneto, can be entirely assembled on this casting. By the removal of only two bolts all working parts, such as the crankshaft, camshaft, bearing, etc., are open to view and inspection. The removal of 18 bolts completely dismantles the entire engine.

Self-oiling is accomplished through a special lubricating system in which the base casting serves as an oil reservoir. The bearing caps have cups to collect the oil which drips from special baffles located directly above on the crank-case cover. Felt retainers on the crankshaft and camshaft, return oil grooves on these shafts and a special crankcase breather eliminate all

By Removing Two Bolts, All Working Parts Are Exposed to View

possibility of leaking oil. The crankcase breather also does away with compression in the crankcase. Instead of forcing the oil out at the gaskets, the special breather sucks in all oil collected at the gaskets by maintaining a partial vacuum within the crankcase.

deLavaud Pipe in 18-ft. Lengths

THE United States Cast Iron Pipe and Foundry Company, Burlington, N. J., is now manufacturing 18-ft. lengths of deLavaud centrifugal cast iron pipe in all diameters from 4 in. to 12 in., inclusive. With these greater lengths of pipe, it is claimed that in comparison with 12-ft. lengths, which have been the most common up to this time, there is a reduction of 33 1/3 per cent in the quantity of jointing materials required, in the labor of making the joints themselves, and in digging the bell holes.

It is said that the equipment necessary for handling these new lengths of deLavaud centrifugal pipe need be no different from that used in handling 12-ft. lengths. By way of example, it is pointed out that the standard weight of an 18-ft. length of 8-in., Class 150 deLavaud pipe, used for 150 lb. maximum working pressure, is 629 lb., as compared with the standard weight of 625 lb. for a 12-ft. length of 8-in., Class C, sand cast pipe designed for 130 lb. maximum working pressure. From this example, it appears that while the 18-ft. deLavaud pipe is 6 ft. longer than the other pipe mentioned, it allows an additional working pressure of 20 lb. and weighs only 4 lb. more.

WITH THE ASSOCIATIONS

American Railway Engineering Association

The Proceedings of the 1929 convention are now in the hands of the binders and will be ready for distribution about the middle of July, much earlier than usual.

During the month of June, six standing committees held meetings which were largely attended by their members. The Committee on Uniform General Contract Forms met at New York on June 4; the Committee on Records and Accounts met at Cleveland, Ohio, on June 7; and the Committee on Economics of Railway Operation and the Committee on Economics of Railway Location met on June 13 and 14, respectively, at Pittsburgh, Pa. The Committee on Grade Crossings held a meeting at Chicago on June 21, and the Committee on Electricity and the Electrical Section, A.R.A., met at New York on June 27. The Board of Direction held a meeting at St. Louis, Mo., on June 17.

As a result of the request of the City of New York that the Association co-operate with it in the revision of its building code, W. T. Dorrance, designing engineer of the New York, New Haven & Hartford, has been named as contact man for the A.R.E.A. in this work.

Bridge and Building Association

The Executive Committee of the American Railway Bridge and Building Association held a meeting at the Chicago Engineers Club in Chicago on June 22 with an attendance of 18. Statements submitted by the chairmen of standing committees indicated that excellent progress had been made on the reports to be presented at the convention to be held in New Orleans on October 15-17. Two reports have been finished and it is estimated that the committee work is now about 80 per cent complete. Plans for the convention were discussed in detail and a tentative program was outlined.

The Roadmasters' Association

The Executive committee of the Roadmasters' and Maintenance of Way Association will hold a meeting at the Hotel Stevens, Chicago, on July 13 for the purpose of completing plans for the annual convention which will be held there on September 17-19. Statements of progress will be submitted by the chairman of the various committees that are to present reports at the convention.

The Track Supply Association, which will present an exhibit at the Hotel Stevens concurrent with the convention of the Roadmasters' association, held an Executive Committee meeting at the hotel on June 28.

Metropolitan Track Supervisors' Club

The annual outing and business meeting of the Metropolitan Track Supervisors' Club was held on June 15 at Pageant Point, New York, and was attended by 100 members and guests. As a result of the election of officers, A. E. Preble, supervisor on the Pennsylvania at Pottsville, Pa., was elected president; C. J. Lepperd, supervisor on the Reading at Pottstown, Pa., was elected first vice-president; P. J. Hurlihe, supervisor on the New York, New Haven & Hartford at Danbury, Conn., was made second vice-president; and W. E. Gadd, The Rail Joint Company, New York, was re-elected secretary-treasurer. Members elected to serve on the executive committee were J. J. Kielty, roadmaster, Delaware, Lackawanna & Western, Hoboken, N. J.; William Ryan, supervisor, Baltimore & Ohio, Staten Island, N. Y.; J. R. MacAsy, general roadmaster, Erie, New York, and Eugene Brandeis, vice-president, Lundie Engineering Corporation, New York.

A Few of Those Who Enjoyed the Outing of the Metropolitan Track Supervisors' Club

The next meeting of the club will be held on October 18, at 6 P.M., at Keen's Chop House, New York, and will be addressed by Earl Stimson, chief engineer of maintenance, Baltimore & Ohio, on the subject of Economies in the Use of Materials.

Directory of Associations

American Railway Bridge and Building Association—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 15-17, 1929, New Orleans, La.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 11-13, 1930, Palmer House, Chicago.

American Wood-Preservers' Association, H. L. Dawson, secretary, 228 North La Salle street, Chicago. Next convention, January 28-30, 1930, Seattle, Wash.

Bridge and Building Supply Men's Association.—W. D. Waugh, secretary, Detroit Graphite Company, Railway Exchange Building, St. Louis, Mo. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers—Roy M. Edmonds, secretary, Syndicate Trust Building, St. Louis, Mo. Next convention, spring of 1930, date and place to be announced later.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 17-19, 1929, Chicago.

Track Supply Association—L. C. Ryan, secretary, Oxweld Railroad Service Company, Chicago. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

RAILWAY NEWS BRIEFLY TOLD

Gray's Gables, a club-house for the Union Pacific Athletic Club of Laramie, Wyo., which is composed of 500 U. P. employees, was formally opened on May 20 by a party of railway officers, including Carl R. Gray, president of that railway, in whose honor the building was named.

Mrs. Paul Weise, wife of the section foreman on the Chicago, Rock Island & Pacific at Brooklyn, Iowa, recently averted a possible accident at that place when a tractor stalled on the main track, on account of lack of gasoline, as a passenger train was due. Noticing the occurrence, Mrs. Weise ran to the crossing and instructed the driver to flag the train while she hurried back to her home to get a can of gasoline.

In the State of Colorado, during the last eight years, 73 grade crossings of main-line railroads with state highways have been eliminated or are in process of being eliminated. Fifty-seven of these eliminations, or 78 per cent of the total, were effected by route changes of the highways, 11 by the construction of underpasses and 5 by overhead structures. When the projects included in the 1929 program are completed there will be only one grade crossing over a main-line railway on the principal north and south highway through the state.

Live stock aggregating 5,732 animals have been killed on the tracks of the Gulf, Mobile & Northern within the last nine years, according to a circular issued by I. B. Tigrett, president of that road, in which he asks the employees of the road and the owners of live stock to co-operate in an effort to stop this waste, which has cost the railway upwards of $20,000 a year in payments to the owners of animals. Mr. Tigrett proposes to property owners that the right of way be fenced on a co-operative basis, whereby, under suitable conditions, the railway will furnish the wire and staples and the land owners the posts and labor.

The volume of freight traffic handled by the Class I railways in April amounted to 38,334,255,000 net ton-miles, an increase of 6.8 per cent over the traffic handled in April last year, according to reports compiled by the Bureau of Railway Economics. For the first four months of 1929, the traffic amounted to 155,887,429,000 net ton-miles, an increase of 5.8 per cent over the corresponding period in 1928. The average daily movement per freight car in April was 32 miles, the highest for any April on record, and an increase of 2.1 miles over that of April a year ago. The average speed of freight trains in April was 13.3 miles an hour, as compared with 12.9 miles per hour in April, 1928, and with 12.3 miles an hour in April, 1927.

Exports of ties from the United States during the first three months of the current year totaled 1,164,720, with a value of $984,495, as compared with exports of 638,329 ties valued at $577,969 for the corresponding period last year, according to the Bureau for Foreign and Domestic Commerce of the U. S. Department of Commerce. The distribution of the ties to the principal receiving countries this year was as follows: United Kingdom, 229,285 ties valued at $154,776; Canada, 246,410 ties, $189,792; Mexico, 176,378 ties, $145,354; Central American states, 154,914 ties, $189,787, and Peru, 134,000 ties, $125,479.

Car loadings of revenue freight continue their upward trend, showing substantial increases over corresponding periods in the two preceding years. Loadings for the week ending June 15 totaled 1,069,089 cars, an increase of 66,276 cars as compared with the same week in 1928 and of 52,610 over the corresponding period in 1927. The cumulative total for the first 24 weeks of the current year was approximately a million cars larger than for the same period last year and was approximately equal to that of 1927, amounting to 23,432,168 as compared with 22,470,714 and 23,481,542 in 1928 and 1927 respectively.

Twenty-seven per cent of all the ties in the railways of Russia need replacement, according to Charles Muchnic, who recently spent several months in that country in the interests of the Baldwin Locomotive Works, during which time he traveled over 6,000 miles of Russian railways. Tie replacements were quite inadequate during the World War and were entirely neglected during the period of civil war. Beginning with this year the tie replacements will be increased and only creosoted or other treated ties will be used instead of those of untreated timber as have been used in the past. Heavier rail, of 105-lb. section, will also be installed to replace the lighter sections.

During the last 38 years, 156,000 trespassers have been killed and 169,000 other trespassers have been injured on American railways, according to the regular monthly circular of the Committee on Education of the Safety Section of the American Railway Association, which has been issued by its new chairman, E. R. Cott, supervisor of safety of the Hocking Valley. Attention is called to the fact that of the 325,000 casualties, 35,000, or more than 10 per cent, were suffered by children under 14 years of age, and that one-third of all the fatal injuries on the railways are chargeable to trespassing on the tracks. There has been a large reduction in the number of persons killed while walking on the tracks since 1915, the American tramp being less numerous than in former years, but there is still much room for improvement.

The Secretary of War has concurred in the action of Major General Edgar Jadwin, chief of engineers, on the application of the North River Bridge Company to construct a bridge across the Hudson river at Fifty-seventh street, New York, by which the applicant was informed that plans will not be approved for vertical clearances of less than 200 ft. at the center and 185 ft. at the pier-head lines, on the grounds that smaller clearances would interfere with navigation. The bridge company's plans provided for a vertical clearance of 185 ft. at the center, 147.8 ft. at the pier-head line on the New Jersey side and 152 ft. on the New York side. Attention was recently attracted to the plan by the publication of a report that the bridge, if built, would be used by the Baltimore & Ohio and other railways now reaching the New Jersey side of the river.

Senator Brookhart, of Iowa, introduced a bill in the Senate on May 23 which, in his estimation, will not only prevent high freight rates that he fears will result from the O'Fallon decision, but will also reduce interest rates and unemployment. The bill provides for the construction by the federal government of a national highway system of 25,000 miles, built to carry the heaviest traffic, "especially to carry truck trains," to compete with the railways, and to be financed by an issue of $2,000,000,000 of non-interest-bearing United States notes. He says this plan would not cost the government anything except the cost of printing the notes, because there would be no interest to pay and the Bureau of Public Roads would be authorized to establish "a system of licenses or tolls for the maintenance of said roads and the redemption of said United States notes at rates which will accomplish such redemption in not more than 20 years nor less than 10 years."

Construction News

The Atchison, Topeka & Santa Fe has been authorized by the Interstate Commerce Commission to construct an extension of the Kansas City, Mexico & Orient (Texas), a subsidiary, from its terminus at Alpine, southwesterly to the Rio Grande near Presidio, 86 miles, at an estimated cost of $3,505,325.

The Bethlehem Steel Corporation has let a contract to the Roberts & Schaefer Company, Chicago, for the construction of a reinforced concrete coaling station of 200-ton capacity at Johnstown, Pa. This installation will include a 100-ton gravity sand handling plant.

The Canadian National has received bids for the clearing of the right-of-way, grading and installation of culverts on the proposed Melfort (Sask.)-Aberdeen branch line, 87 miles.

A contract for the construction of a coaling station of 300 tons' capacity at Carrick, Man., has been left to the Claydon Company, Winnipeg, Man.

The Canadian Pacific has let a contract to Anglin-Norcross, Ltd., Toronto, Ont., for the construction of new facilities at Toronto which will include a roundhouse and turntable and an ash handling plant. The expenditure for the work will approximate $800,000.

The Canadian Board of Railway Commissioners has ordered this company to proceed with the construction of a tunnel connection at Vancouver, B. C., between its main line and Falls Creek yards, which will eliminate grade crossings at Alexander, Columbia, Powell, Cordova, Carrall, Hastings and Pended streets. It is estimated the cost of this project, involving the driving of a tunnel 4,600 ft. long, would be about $1,720,000, which would be apportioned among the Canadian Pacific, and British Columbia Electric and the City of Vancouver.

The Chicago, Burlington & Quincy has awarded a contract for four cinder-handling plants for installation at Eola, Ill., and Savanna, and Gibson, Neb., and Alliance to the Roberts & Schaefer Co., Chicago.

The Chicago, Rock Island & Pacific has awarded a contract to the Clinch-Mitchell Construction Company, Chicago, for the construction of a new line between Coburn, Mo., and a point near Nettleton, about 18 miles. This contract covers grading, bridging, track construction, fencing and buildings and represents about one-fourth of the mileage which it is planned to construct between Coburn and a point near Kansas City.

The Delaware & Hudson has been directed by the New York Public Service Commission to proceed with the reconstruction and relocation of its tracks and the state highway underpass on its lines at Harpursville, N. Y.

The Detroit & Toledo Shore Line has let a contract to H. W. McKenzie, Detroit, Mich., for the construction of a grade-separation structure over Southfield road at Ecorse, a suburb of Detroit, at a cost of about $190,000.

The Erie has received bids for work in connection with the reconstruction of its shops as Susquehanna, Pa., which will include the rebuilding of several existing units and the construction of additional buildings. The cost of this project, together with equipment is estimated to entail an expenditure of $378,000.

The Fort Worth & Denver Northern, a subsidiary of the Colorado & Southern, has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Childress, Tex., to Pampa, 110 miles.

The Gulf & West Texas has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Fredericksburg, Tex., to Brady and thence to Eden and San Angelo, 113 miles, or as an alternative route, from Wetmore to Fredericksburg and thence to Brady and Eaton, 170 miles. R. W. Morrison, San Antonio, Tex., is president.

The Kansas City Southern plans the construction at Beaumont, Tex., of trackage additions, car-repair tracks, an eight-stall roundhouse, a machine shop, a scale and an office building, at a total cost of about $1,000,000.

The Lehigh Valley according to a plan filed by the State Department of Public Works, will be called upon to eliminate 10 highway grade crossings on its lines in Van Etten, N. Y., at an estimated cost of $400,000.

The Long Island has been authorized by the New York Public Service Commission to proceed with its work of eliminating six grade crossings along its right of way at a total cost of approximately $145,000.

The New York Central has awarded contract for construction work as follows: To the McClintic-Marshall Company, New York, for the manufacture, delivery and erection of structural steel for its warehouse on West End avenue between Sixty-fifth and Sixty-sixth streets; to the Walsh Construction Company, Davenport, Ia., for grading, tunnel substructure and track work for third and fourth tracking on its lines from Chelsea to Poughkeepsie, N. Y.; to the P. T. Cox Contracting Company, Inc., New York, for work in connection with covering the openings and strengthening the roof over its tracks along Park avenue between Seventy-second and Eighty-sixth streets, New York.

The New York Board of Estimates has approved the plans and form of contract for the West Side improvement project in New York City, which carries with it the elimination of the grade crossings of the New York Central on Manhattan Island.

The New York, New Haven & Hartford has awarded a contract to C. W. Blakeslee & Sons, New Haven, Conn., for the widening of Sound Beach underpass on its lines in Greenwich, Ct. The project will cost $100,000, of which 25 per cent will be assumed by the railroad.

The New York, Pittsburgh & Chicago's application for a certificate authorizing the construction of a new line across Pennsylvania will continue to be held in suspense by the Interstate Commerce Commission as a result of recent correspondence between the commission and L. F. Loree, representing the railway. Mr. Loree stated that new surveys were being made and that further time was desired to present additional facts.

The Pennsylvania has recently awarded a contract to Gibbs & Hill, Inc., New York, for the completion of work in connection with the new parcel room, offices, trainmen's quarters, exit concourse concessions and enclosures at the Pennsylvania station in New York, estimated to cost $300,000. A contract has been let to the Vare Construction Company, Philadelphia, Pa., for the erection of catenary bridges, catenary system, track bonding and the intallation of necessary electrical equipment including sub-station foundations in connection with electrification between Philadelphia and Trenton, N. J., to cost approximately $2,000,000. Another contract to the same company provides for the construction of concrete foundations and guy anchors for catenary supporting structures in connection with electrification between Liddonfield, Pa., and Trenton, N. J., to cost about $600,000.

Plans have been filed with the authorities at Jersey City, N. J., for the construction of a large storage warehouse, the first unit of this company's $50,000,000 ship-rail terminal to be built in that city.

The Prince George & Chesterfield has awarded a contract for the construction of this line to the MacDougald Construction Company, Atlanta, Ga. The new line will connect with the Seaboard Air Line at Bellwood, Va., and will extend to Hopewell, Va., a distance of 16½ miles.

The Reading has awarded two contracts in connection with the track elevation and improvements of its facilities at Manayunk, Philadelphia, Pa., to the O'Neill Construction Company, Chestnut Hill, Pa. The first provides for a passenger station to be located between Gay and Carson streets, Manayunk, an the levated track level. The second involves the construction of a freight yard extending from north of the Philadelphia Electric sub-station, at Green lane, to Leverington avenue along Main street, with a coal yard at Leverington avenue.

The St. Louis-San Francisco plans the construction of a passenger station at Aberdeen, Miss., to cost about $60,000.

The St. Louis Southwestern has awarded a contract to Winston Brothers, St. Paul, Minn., for the construction of an extension between Hornersville, Mo., and Leachville, Ark., 11 miles. Bids were closed on June 25 for the construction of a new line between Gideon, Mo., and Deering, 20 miles, and the rehabilitation of the Gideon & North Island between Gideon and Malden, 9 miles. The latter project involves the placing of 589,000 cu. yd. of embankment.

The San Luis Valley Southern will receive bids until July 5 for the construction of an extension from Jaroso, Colo., to Questa, N. M., 18.5 miles.

The Southern closed bids on June 17 for the construction of second main track between Rogers Gap, Ky., and Lexington, 19.6 miles. The work to be done under contract includes grading and the construction of concrete structures and pipe culverts.

The Union Pacific and the Chicago, Burlington & Quincy have reached an agreement with the city of Omaha (Neb.) for the construction of a viaduct over their tracks between Twenty-fourth and Martha streets and Twenty-seventh street and Ed Creighton avenue, Omaha. About 80 per cent of the cost of the viaduct, which will be approximately $250,000, will be borne by the Union Pacific and 20 per cent will be borne by the Burlington. The city will spend about $35,000 for miscellaneous items of construction in connection with the project.

The Wabash has let a contract for grading in connection with the construction of an extension to the yards at Decatur, Ill., to theWalsh Construction Company, Davenport, Iowa. The improvement involves the construction of 11 tracks, each 4,800 ft. long, and the excavation of 175,000 cu. yd. of earth.

The Western Pacific's application to the Interstate Commerce Commission for a certificate authorizing it to extend its line by 138 miles up the San Joaquin valley in California from a connection with the W. P. at Nilegarden, about 11 miles south of Stockton, to a point on Kings River about 21 miles southeast of Fresno, should not be approved, according to a proposed report submitted by an examiner of the commission.

A contract for about 100,000 cu. yd. of grading in connection with the construction of passing tracks at Pulga, Cal., and Belden, has been let to W. A. Bechtel, San Francisco, Cal. Track will be laid by company forces.

The Yankton, Norfolk & Southern has awarded a contract for grading this line, which will be constructed between Yankton, S. D. and Norfolk, Neb., 65 miles, to Thiesen Brothers, Osmond, Neb.

Supply Trade News

General

The Celotex Company has moved its Chicago offices to 919 North Michigan avenue.

The Hopkins Company, Chicago, has been appointed representative for the Central territory of the Track Specialties Company, New York.

The Bucyrus-Erie Company, South Milwaukee, Wis., will build an extension to its machine and erecting shop, to cost $65,000, and a locomotive house to cost $27,000.

The Buda Company, Harvey, Ill., has awarded a contract to the Austin Company, Cleveland, O., for the design and construction of a one-story, steel-frame inspection and storage building.

The American Hoist & Derrick Company, St. Paul, Minn., has moved its Chicago office to 1000 Engineering building, 205 West Wacker drive. The Pittsburgh branch office of this company has been moved to the Farmers Bank building.

Personal

Page Harris, vice-president of the National Lumber & Creosoting Company, Texarkana, Ark., died on June 18 at Houston, Tex.

Joshua A. Logan, whose election as president of the National Lumber & Creosoting Company, Texarkana, Ark., was noted in the June issue, was born on December 16, 1894, at El Paso, Tex. Mr. Logan attended Washington University, St. Louis, Mo., where he studied chemical engineering, and entered the United States Army in April, 1917, where he became a first lieutenant and served about six months in France. After his return to civil life in 1919, he was employed in the chemical department of the Texas Company at its refineries in Southeastern Texas. In 1923 he became a chemist in the Houston (Tex.) plant of the National Lumber & Creosoting Company, and later was advanced to assistant to the manager of the Kansas City (Mo.) plant and to superintendent of the Houston plant and office. In 1927, Mr. Logan was promoted to assistant to the president at Texarkana, which position he was holding at the time of his recent election as president.

Joshua A. Logan

S. Howard Eisenberg has been appointed district representative for Wyoming, Colorado and New Mexico for the Foote Gear & Machine Company, with headquarters at 2812 Ash street, Denver, Colo. This company has established a Western sales office at 1855 Industrial street, Los Angeles, Cal.

Eugene Brandeis, secretary and treasurer of the Lundie Engineering Corporation, New York, has been promoted to vice-president with the same headquarters. Mr. Brandeis, who has been with the Lundie Engineering Corporation since its formation, was connected for a number of years with the maintenance of way department of the Pennsylvania at Philadelphia, Pa.

Edward C. Brown, foreign manager of the Dearborn Chemical Company, Chicago, with headquarters at Buenos Aires, Argentina, has been elected vice-president and Eastern sales manager in charge of the New York office and the Eastern department to succeed **Grant W. Spear,** who has retired from active service, but who will continue as a director and will act in an advisory capacity. Mr. Brown has been succeeded at Buenos Aires by **W. M. Campbell,** who was his secretary at that point.

Edward C. Brown

Mr. Brown has been with the Dearborn chemical company for 30 years, of which 11 years were spent in the Hawaiian Islands. Following this he was for several years in China, Japan and the Philippine Islands, establishing business for the company. After his return to this country, he remained for two years in the general offices at Chicago and New York, and then was sent to South America to investigate that field, resulting in the opening of branch office at Buenos Aires, and the promotion of Mr. Brown to the position of foreign manager, in which capacity he was acting at the time of his recent advancement to vice-president and Eastern sales manager.

Personal Mention

General

F. W. Brown, roadmaster on the Chicago, Rock Island & Pacific at Centerville, Iowa, has been promoted to acting trainmaster at Trenton, Mo.

J. W. Graves, division engineer on the Erie, with headquarters at Hornell, N. Y., has been appointed trainmaster, with headquarters at the same point.

H. E. Newcomet, general manager of the Western region of the Pennsylvania, with headquarters at Chicago, who is an engineer by training and experience, has been promoted to vice-president of that region to succeed **T. B. Hamilton,** who has been elected to the newly-created office of vice-president, Chicago, in which position he will be assigned matters of general interest and policy in the Chicago district. **J. C. Poffenberger,** division engineer of the Middle division at Altoona, Pa., has been promoted to superintendent of the Monongahela division at Uniontown, Pa.

Mr. Newcomet was born on April 27, 1874, at Philadelphia, Pa., and graduated from the University of Pennsylvania in 1894. He entered railway service in 1896 as an assistant on an engineering corps on the Chicago division of the Pennsylvania and was promoted to assistant engineer in 1897 and to assistant engineer maintenance of way

H. E. Newcomet

on the Cincinnati division in 1898. In June, 1901, he was promoted to engineer maintenance of way of the Indianapolis and Vincennes division and later served in the same capacity on the Cincinnati division and the Erie and Ashtabula division, until his promotion to division engineer of the Cleveland and Pittsburgh division in 1906. He entered the operating department in January, 1913, as superintendent of the Louisville division, and was promoted to general superintendent of the Lake division at Cleveland, Ohio, in 1923. This was followed by his promotion to general manager of the Western region in September, 1926, which position he was holding at the time of his recent promotion to vice-president of that region.

Mr. Poffenberger was born on April 10, 1888, at Harrisburg, Pa., and graduated from Lehigh University in 1911, following which he entered the service of the Pennsylvania as a rodman. After various promotions he became an assistant supervisor on the Trenton division, later serving on other divisions until October, 1916, when he was promoted to supervisor on the Cresson division. After being transferred successively to the Philadelphia and the Philadelphia Terminal divisions, Mr. Poffenberger was promoted to division engineer of the Conemaugh division at Pittsburgh, and was holding the position of division engineer of the Middle division at Altoona, Pa., at the time of his recent promotion to superintendent of the Monongahela division.

Changes on the Baltimore & Ohio

Several promotions involving officers with engineering training and experience were made on the Baltimore & Oio, effective June 15, as follows: **H. B. Voorhees,** general manager of the Western Lines at Cincinnati, Ohio, has been elected vice-president and executive representative of that road at Chicago and also president of the Baltimore & Ohio Chicago Terminal. **Donald F. Stevens,** general superintendent of the Northwest district at Cleveland, Ohio, has been promoted to general superintendent of transportation, with headquarters at Baltimore, Md. **C. R. Elkins,** transportation assistant at Pittsburgh, Pa., has been promoted to superintendent of transportation of the Western Lines at Cincinnati, and **John Hewes, Jr.,** assistant superintendent of the Akron division at Akron, Ohio, has been promoted to transportation assistant to succeed Mr. Elkins at Pittsburgh.

Mr. Voorhees was born on January 22, 1876, and graduated from Rensselaer Polytechnic Institute in 1896. He entered railway service in the latter year as an assistant supervisor on the Reading at Tamaqua, Pa., and was promoted to supervisor on March 1, 1898. On August 1, 1898, he entered the operating department as an assistant trainmaster at Reading, Pa., and later was promoted to trainmaster. On December 1, 1901, he entered the service of the B. & O. as an assistant engineer at Pittsburgh, Pa., and was promoted to division engineer at Baltimore on August 1, 1902. On September 1, 1903, Mr. Voorhees was appointed assistant to the general superintendent of transportation, since which time he has been successively superintendent and general agent at Philadelphia, assistant to the president, general superintendent of transportation, general manager of the New York terminal lines, and general manager of the Western Lines. He was holding the last-named position at the time of his recent election as vice-president of the B. & O. and president of the B. & O. C. T. at Chicago.

Mr. Stevens was born on November 4, 1882, at Minneapolis, Minn., and was educated at Cornell University. He entered railway service in 1899 as a clerk on the Great Northern and later served as an axeman. From June, 1902, he was engaged consecutively as a timekeeper on the Canadian Pacific, a rodman on the Great Northern, a clerk and gang foreman on the Chicago, Rock Island & Pacific, a roadmaster on the Great Northern, an extra gang

H. B. Voorhees

foreman on the Rock Island and as a yardmaster and trainmaster on the New York, New Haven & Hartford. He was appointed assistant supervisor of fuel consumption on the B. & O. in November, 1914, and was promoted successively to trainmaster, assistant superintendent and superintendent until April, 1923, when he was promoted to general superintendent of the Northwest district, which position he was holding at the time of his recent promotion to general superintendent of transportation.

Mr. Elkins was born on December 25, 1884, at North Troy, Vt., and was educated at the Massachusetts Institute of Technology. He entered the service of the B. & O. in 1911 as a draftsman and was promoted to superintendent of operation of yards and terminals in 1915. He was appointed assistant supervisor of maintenance in June, 1916, and in October of the same year was appointed a trainmaster, being promoted to assistant to the general manager in 1917. During the World War he was a lieutenant at the Norfolk Navy Yard in charge of transportation for the Fifth Naval district, returning to the B. & O. in February, 1919, as special engineer on the general manager's staff. He was promoted to assistant superintendent of transportation at Cincinnati and was further promoted to transportation assistant at Pittsburgh in September, 1919, which position he was holding at the time of his recent promotion to superintendent of transportation of the Western Lines.

Mr. Hewes was born on December 9, 1887, at Baltimore, Md., and entered railway service in 1905 as an axeman on the B. & O., serving in various positions to instrumentman until 1914, when he was promoted to bridge in-

spector at Cincinnati. He was promoted to assistant superintendent of the Ohio division at Hamden, Ohio, in 1915, and in the following year was made draftsman in the chief engineer's office. In 1917, he was promoted to field engineer and to assistant engineer in 1918. Later in 1918 he was promoted to division engineer at Flora, Ill., and in 1925 was promoted to assistant superintendent of the Akron division, which position he was holding at the time of his recent promotion to transportation assistant.

Engineering

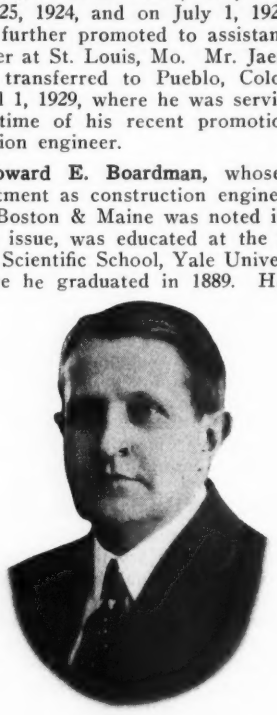
W. K. Tate, track supervisor on the Nashville, Chattanooga & St. Louis at Tullahoma, Tenn., has been promoted to industrial engineer, with headquarters at Nashville, Tenn.

Thomas P. Rollow, Jr., whose promotion to division engineer on the Gulf, Colorado & Santa Fe was noted in the May issue, was born on September 15, 1884, at Quitman, Ark., and graduated from Cornell University in 1909. He entered railway service on September 6, 1909, on the Gulf, Colorado & Santa Fe, where he served successively as chainman, rodman and transitman until November, 1919, when he was promoted to assistant division engineer. In February, 1927, Mr. Rollow was appointed assistant engineer on shop construction, which position he was holding at the time of his recent promotion to division engineer.

J. E. King, assistant engineer maintenance of way of the Chesapeake & Ohio, at Richmond, Va., has ben promoted to engineer maintenance of way, and **A. E. Botts,** general inspector of bridges and buildings at Richmond, has been promoted to assistant engineer maintenance of way to succeed Mr. King. **H. L. McCutcheon,** assistant division engineer at Covington, Ky., has been promoted to division engineer at Hinton, W. Va., to succeed **H. M. Church,** whose promotion to general inspector of bridges and buildings will be found elsewhere in these columns. **P. L. Koehler** has been appointed assistant division engineer at Covington to succeed Mr. McCutcheon.

Claymore J. Jaeschke, whose promotion to division engineer on the Missouri Pacific at Wynne, Ark., was noted in the June issue, was born on October 21, 1894, at Chicago, and graduated from the University of Chicago in 1914. He entered the employ of the Missouri Highway Commission on July 1, 1914, and on January 1, 1915, became an instrumentman for the city engineer of Jefferson City, Mo. He entered railway service on August 1, 1915, as a track laborer on the Missouri Pacific and was advanced to extra gang timekeeper and rail checker, in which position he served until January 20, 1916, when he became a rodman, serving in that capacity and an instrumentman until January 25, 1924, with the exception of the period following December 26, 1917, when he was in military service. He was promoted to roadmaster at McGehee, Ark., on January 25, 1924, and on July 1, 1925, he was further promoted to assistant engineer at St. Louis, Mo. Mr. Jaeschke was transferred to Pueblo, Colo., on April 1, 1929, where he was serving at the time of his recent promotion to division engineer.

Howard E. Boardman, whose appointment as construction engineer of the Boston & Maine was noted in the June issue, was educated at the Sheffield Scientific School, Yale University, where he graduated in 1889. He entered railway service in the same year as an instrumentman on preliminary surveys on the Pennsylvania, and in 1901 and 1902 was an assistant on an engineer corps on the same road, in which capacity he was in charge of the construction of a large yard at Conway, Pa. He was then promoted to assistant engineer on the construction of the North River tunnels and later was promoted to senior assistant engineer. In 1909 he was appointed senior assistant engineer on the Missouri Pacific, at St. Louis, Mo., and in 1911 was promoted to division engineer, with headquarters at the same point. From 1912 to 1916 Mr. Boardman was chief engineer of the Buenos Aires Western at Buenos Aires, Argentina, in charge of extensive terminal and tunnel construction. He returned to this country in 1916 and became engineering assistant to the general valuation counsel of the New York Central Lines at New York, remaining in that position until 1923, when he left railway service to enter other business, re-entering the railway field at the time of his recent appointment as construction engineer of the Boston & Maine.

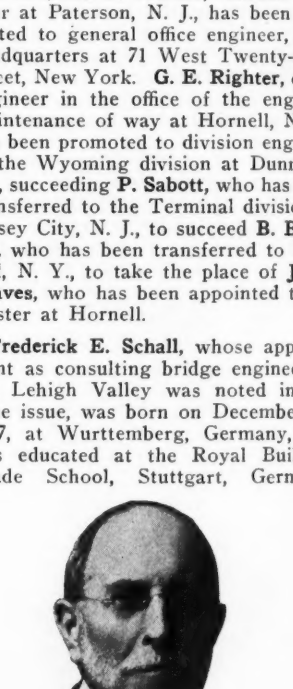


Howard E. Boardman

G. A. Phillips, engineer maintenance of way of the Lehigh Valley, with headquarters at Bethlehem, Pa., has been promoted to chief engineer of maintenance, with headquarters at the same point. Mr. Phillips was born on September 28, 1889, at Dorchester, Mass., and graduated from the University of Maine in 1911. He entered the service of the Lehigh Valley in February, 1912, as an instrumentman, and was promoted to assistant engineer on the Seneca division in September, 1915. He was promoted to supervisor of track at Delano, Pa., in April, 1916, and in November of the same year was further promoted to division engineer at Hazleton, Pa., later being transferred to the Seneca division. Mr. Phillips was promoted to engineer maintenance of way in April, 1926, which position he was holding at the time of his recent promotion to chief engineer of maintenance on June 1.

G. S. Fanning, assistant chief engineer of the Erie, with headquarters at New York, has been promoted to chief engineer, with the same headquarters, succeeding as chief engineer, **R. C. Falconer,** assistant vice-president and chief engineer, who has been appointed assistant vice-president in charge of engineering. The position of assistant chief engineer has been abolished. **J. W. Smith,** office engineer at New York, has been promoted to principal assistant engineer, with the same headquarters, and **O. V. Derr,** resident engineer at Paterson, N. J., has been promoted to general office engineer, with headquarters at 71 West Twenty-third street, New York. **G. E. Righter,** office engineer in the office of the engineer maintenance of way at Hornell, N. Y., has been promoted to division engineer of the Wyoming division at Dunmore, Pa., succeeding **P. Sabott,** who has been transferred to the Terminal division at Jersey City, N. J., to succeed **B. Blowers,** who has been transferred to Hornell, N. Y., to take the place of **J. W. Graves,** who has been appointed trainmaster at Hornell.

Frederick E. Schall, whose appointment as consulting bridge engineer of the Lehigh Valley was noted in the June issue, was born on December 19, 1857, at Wurttemberg, Germany, and was educated at the Royal Building Trade School, Stuttgart, Germany, which he attended from 1873 to 1878. During this period he worked during the summer months on road construction with a contracting firm in Germany. In 1883 he became a draftsman in the chief engineer's office of the Lehigh Valley, and in 1887 he was made a draftsman and designer in the



Frederick E. Schall

bridge department. In 1888 he was promoted to chief draftsman, and in 1897 he was promoted to assistant engineer in charge of the chief engineer's office. In 1899 he was further promoted to bridge engineer, which position he was holding at the time of his recent appointment as consulting bridge engineer.

H. T. Rights, whose promotion to bridge engineer of the Lehigh Valley, with headquarters at Bethlehem, Pa., was noted in the June issue, was born on April 28, 1874, at Tahlequah, Okla., and in 1895 graduated from Lehigh University. He entered railway service

H. T. Rights

with the Lehigh Valley in 1895 as a rodman, and in 1896 was transferred to the bridge department as a draftsman and computer. In 1898 he became a draftsman for the Berlin Iron Bridge Company at East Berlin, Conn., and in 1899 returned to the Lehigh Valley as a computer and designer at Bethlehem. In 1900 he was promoted to bridge inspector, which position he held until 1903, when he again left the Lehigh Valley to become a draftsman for the Phoenix Bridge Company, later being employed by the Shoemaker Bridge Company at Pottstown, Pa., as squad master, estimator and assistant engineer in charge of estimating and designs. He returned to the Lehigh Valley in 1923 as assistant to the bridge engineer, at Bethlehem, and in 1924 he was promoted to assistant bridge engineer, which position he was holding at the time of his recent promotion to bridge engineer.

T. W. Pinard, assistant chief engineer maintenance of way of the Western region of the Pennsylvania, with headquarters at Chicago, has been appointed engineer of bridges and buildings of the New York zone, with headquarters at New York.

Track

P. Bohan, roadmaster on the Canadian National at Jellico, Ont., has been transferred to Allandale, Ont., to succeed **Hector McPhail,** whose retirement was noted in the June issue.

John P. Malay, assistant roadmaster on construction on the LaCrosse division of the Chicago, Burlington & Quincy, has been promoted to roadmaster, with headquarters at La Crosse, Wis., succeeding **C. H. Freed,** who has been transferred to Galesburg, Ill., to succeed **J. Johns,** deceased.

G. W. Lindsey has been appointed assistant supervisor on the New York Central at Monroe, Mich., in the place of **C. E. Maloney,** who has been promoted to supervisor at Franklin, Pa., to succeed **Timothy Ryan,** who has been transferred to Ashtabula to succeed **Sherman Jordan,** deceased.

T. H. Bilbrey has been promoted to roadmaster on the Chicago, Rock Island & Pacific at El Reno, Okla., to succeed **George Woods,** deceased. **W. S. March** has been promoted to acting roadmaster at Centerville, Iowa, to succeed **T. W. Brown,** who has been promoted to acting trainmaster at Trenton, Mo.

W. H. Gunning, section foreman on the Canadian Pacific at Aylen, Ont., has been promoted to roadmaster at Mattawa, Ont., to take the place of **K. O. Shepard,** who has been transferred to Chapleau, Ont., to succeed **D. Wilson,** who, in turn, has been transferred to London, Ont., succeeding **P. Coakley,** who has retired.

C. I. Van Arsdalen, supervisor on the Illinois at Springfield, Ill., has been promoted to roadmaster at East St. Louis, Ill., to succeed **S. C. Jump,** who has been transferred to Freeport, Ill., succeeding **E. J. Boland,** who has been appointed supervisor at that place, where he succeeds **W. N. Cramer,** who has been transferred to Springfield to take the place of Mr. Van Arsdalen.

Charles W. Palmer, whose promotion to roadmaster on the Canadian National was noted in the May issue, was born at Wentworth, N. S., in September, 1881, and entered railway service as a trackman on the Intercolonial (now a part of the Canadian National) in 1901. He was promoted to section foreman at Maccan, N. S., July 23, 1913, and in 1916 to extra gang foreman. He was further promoted to relieving roadmaster on May 10, 1926, which position he was holding at the time of his recent promotion.

Ralph W. Riser, whose promotion to supervisor on the Pennsylvania was noted in the June issue, was born on Nov. 2, 1899, at Cumberland, Ind., and graduated from Purdue University in 1924. Mr. Riser entered railway service in 1922, during his summer vacation, as an assistant on an engineer corps on the Pennsylvania at Louisville, Ky., and after the completion of his engineering course he became an assistant engineer on construction at Ft. Wayne, Ind., for the Interstate Public Service Corporation. He returned to the Pennsylvania in February, 1925, as assistant on engineer corps at Indianapolis, Ind., and was promoted to assistant supervisor at Morrow, O. He was transferred successively to Cincinnati, O., and Xenia, and was located at the latter point at the time of his promotion to supervisor, with headquarters at Hamilton, O.

Edward J. Graney, whose promotion to supervisor of track on the New York Central, with headquarters at Remsen, N. Y., was noted in the June issue, was born at Weedsport, N. Y., and entered railway service with the West Shore (now a part of the New York Central) on August 13, 1906, where he served successively as timekeeper, laborer, section foreman, extra gang foreman and work-train foreman until July 16, 1920. At that time he was promoted to assistant supervisor of track at East Buffalo, N. Y., where, during the last three years, he was engaged on the track layout for the new Buffalo station until the time of his recent promotion to supervisor.

Earl J. Pratt, whose promotion to roadmaster on the Oregon Short Line at Dillon, Mont., was noted in the June issue, was born on October 27, 1893, at Provo, Utah, and entered railway service in the O. S. L. shops at Pocatello, Idaho, on March 3, 1914. He became a track laborer on the same road on February 2, 1917, and was promoted to section foreman on March 18, 1918, and to extra gang foreman in 1923. In 1928, he was a construction foreman and relief roadmaster in the engineering department and on December 20 of the same year was promoted to assistant roadmaster of the Salt Lake district, which position he was holding at the time of his recent promotion to roadmaster.

Marion W. Brown, whose promotion to roadmaster on the Chicago, Burlington & Quincy, at Hannibal, Mo., was noted in the June issue, was born on October 29, 1904, at Troy, Mo., and entered railway service as a section laborer on the Burlington in March, 1916, working in this capacity during the summers until his graduation from high school in 1923, when he became a timekeeper on an extra gang. Six weeks later he was promoted to extra gang foreman and in 1927 was promoted to assistant roadmaster at Cameron Junction, Mo., later being transferred to Hannibal. When this position was abolished in 1928, Mr. Brown became a section foreman at Chicago and later was made extra gang foreman, which position he was holding at the time of his recent promotion.

C. H. Morse, whose promotion to general track inspector of the New York Central (Buffalo and East), with headquarters at New York City, was noted in the June issue, was born on September 14, 1885, at Brandon, Vt., and was educated at Columbia University, where he undertook special work during 1910 and 1111. He entered railway service with the New York Central on August 13, 1902, in the office of the superintendent at Watertown, N. Y., and from September 10, 1907, to October 23, 1909, he served as chainman, rodman and transitman on an engineer corps with the same headquarters. On October 23, 1909, he was promoted to draftsman in the office of

the engineer maintenance of way at New York, and on June 20, 1912, he was promoted to assistant supervisor of track, with headquarters at Hudson, N. Y., serving in this capacity and as acting supervisor until September 1, 1920, he was promoted to supervisor at Clearfield, Pa. On June 1, 1925, he was transferred to Kingston, N. Y., where he remained until his recent promotion to general track inspector.

F. Ivers, Jr., roadmaster on the Oregon Short Line at Pocatello, Idaho, has been promoted to general roadmaster with headquarters at the same point. Mr. Ivers entered railway service with the Chicago, Burlington & Quincy in Nebraska and from 1901 to June 1, 1910, served successively as section and extra gang foreman, brakeman, switchman, general yard foreman at Lincoln, Neb., assistant roadmaster and roadmaster, resigning on the latter date to become roadmaster on the Denver & Rio Grande Western. On June 17, 1924, and he was appointed assistant superintendent on the Colorado & Wyoming, where he remained until December 31 of that year, when the position was abolished. From January 1, 1925, to July 31, 1925, he was roadmaster on the Denver & Salt Lake and on August 17, 1925, entered the service of the Oregon Short Line as an extra gang foreman in the engineering department. Thereafter he served at various times as section foreman, extra gang foreman and assistant roadmaster until December 1, 1928, when he was promoted to roadmaster at Dillon, Mont. On May 16, he was transferred to Pocatello, where he was located at the time of his promotion to general roadmaster on June 1.

C. H. Comstock, supervisor on the Erie and Ashtabula division of the Pennsylvania at New Castle, Pa., has been promoted to inspector of maintenance of way. **C. W. Heinze,** assistant on engineer corps on the Pittsburgh division, has been promoted to assistant supervisor at Wellsville, Ohio, to succeed Fred Lundberg, who has been promoted to supervisor at Dunkirk, N. Y., where he succeeds **Oliver Downs,** who has been transferred to Oil City, Pa., to succeed **C. H. Meintel,** who in turn has been transferred to New Castle to succeed Mr. Comstock. **C. E. Penniman,** track foreman on the Erie & Ashtabula division, has been promoted to assistant supervisor on the Buffalo division to succeed **J. J. Fobean,** who has returned to his former position of general foreman on the Eastern division. **J. W. Reed,** assistant on engineer corps on the Pittsburgh division, has been promoted to assistant supervisor at Oil City, Pa.

Bridge and Building

J. L. McAllister, whose promotion to bridge and building master on the Canadian National, with headquarters at Cochrane, Ont., was noted in the May issue, was born on April 13, 1884, at Coal Mines, N. B. He entered railway service on August 18, 1916, as a carpenter on the Canadian National and was promoted to building inspector on May 2, 1917, and to bridge and building foreman on September 2 of the same year, serving alternately in these positions until September 15, 1920, when he became a construction foreman on the Quebec district. He was made a bridge and building foreman on the Saguenay division on May 19, 1925, and was holding that position at the time of his recent promotion to bridge and building master.

H. A. Cameron has been appointed chief carpenter of the Madison division of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Madison, Wis., succeeding **William Reilly,** who has been assigned to other duties.

Charles H. Mills, assistant master carpenter on the St. Louis division of the Pennsylvania at Decatur, Ill., has retired on account of ill health after 50 years' service with that company.

H. M. Church, division engineer on the Chesapeake & Ohio at Hinton, W. Va., has ben promoted to general inspector of bridges and buildings at Richmond, Va., to succeed **A. E. Botts,** who has been promoted to assistant engineer maintenance of way.

Water Service

D. C. Teal, field draftsman in the water supply department of the Chesapeake & Ohio at Richmond, Va., has been promoted to assistant engineer water supply, with headquarters at the same point. Mr. Teal was born on February 15, 1900, at Arcadia, Ind., and graduated from Purdue University in 1923. He was employed by the City Planning Commission of the City of Indianapolis (Ind.) for a year and entered railway service in April, 1924, as an instrumentmanon the C. & O. at Peru, Ind. In January, 1927, he was promoted to assistant cost engineer on the Clifton Forge division at Clifton Forge, Vt., and in July of the same year became field draftsman in the water supply department at Richmond, which position he was holding at the time of his recent promotion to assistant engineer water supply.

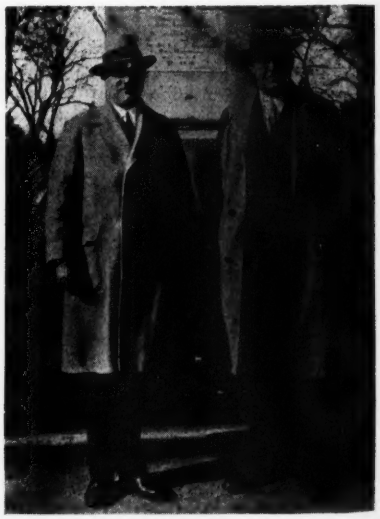
Obituary

B. H. McNamara, master carpenter on the Chicago, Rock Island & Pacific at Dalhart, Tex., died in that city on April 19 from injuries sustained in an automobile accident on April 13. Mr. McNamara entered the service of the Rock Island on February 6, 1902, as a bridge and building carpenter at Eldon, Mo., and in October, 1912, was promoted to master carpenter at that point. He was transferred to Dalhart in 1916, where he was located at the time of his death.

B. O. Thistle, roadmaster in the Los Angeles harbor district of the Southern Pacific, died suddenly on May 22 at Santa Ana, Cal. He had sustained injuries in an automobile accident on April 8 and had not been on duty from that date until the time of his death. Mr. Thistle was born in Norway on September 28, 1872, and was brought to this country by his parents shortly after his birth. He entered the service of the Southern Pacific at Sacramento, Cal., in September, 1897, and in 1924 was promoted to roadmaster at Tehachapi, Cal. In 1925 he was transferred to Los Angeles with jurisdiction over the tracks in the harbor district, which position he was holding at the time of his death.

R. P. Mills, retired general bridge inspector on the New York Central, Buffalo and East, died at his home at Mt. Vernon, N. Y., on May 27, at the age of 76 years. Mr. Mills entered the service of the New York Central on December 1, 1899, as a general bridge and building foreman on the Eastern division, and was promoted to supervisor of buildings in 1902, holding this position until his retirement from active service on February 1, 1923. He was given the title of general bridge inspector in March, 1923, and continued to hold this title in retirement until the time of his death.

F. M. Griffith, supervisor of bridges and buildings of the Cincinnati and Northern divisions of the Chesapeake & Ohio, with headquarters at Covington, Ky., died on March 29 at Huntington, W. Va., after a week's illness. Mr. Griffith was born on March 22, 1860, at Hammond, W. Va., and entered the service of the C. & O. on September 15, 1880, as a carpenter on the Lexington division. He was promoted to foreman on February 1, 1888, and on August 15, 1896, was transferred to the Cincinnati division. On March 1, 1904, he was promoted to supervisor of bridges and buildings on that division and the Northern division, which position he was holding until at the time of his death.



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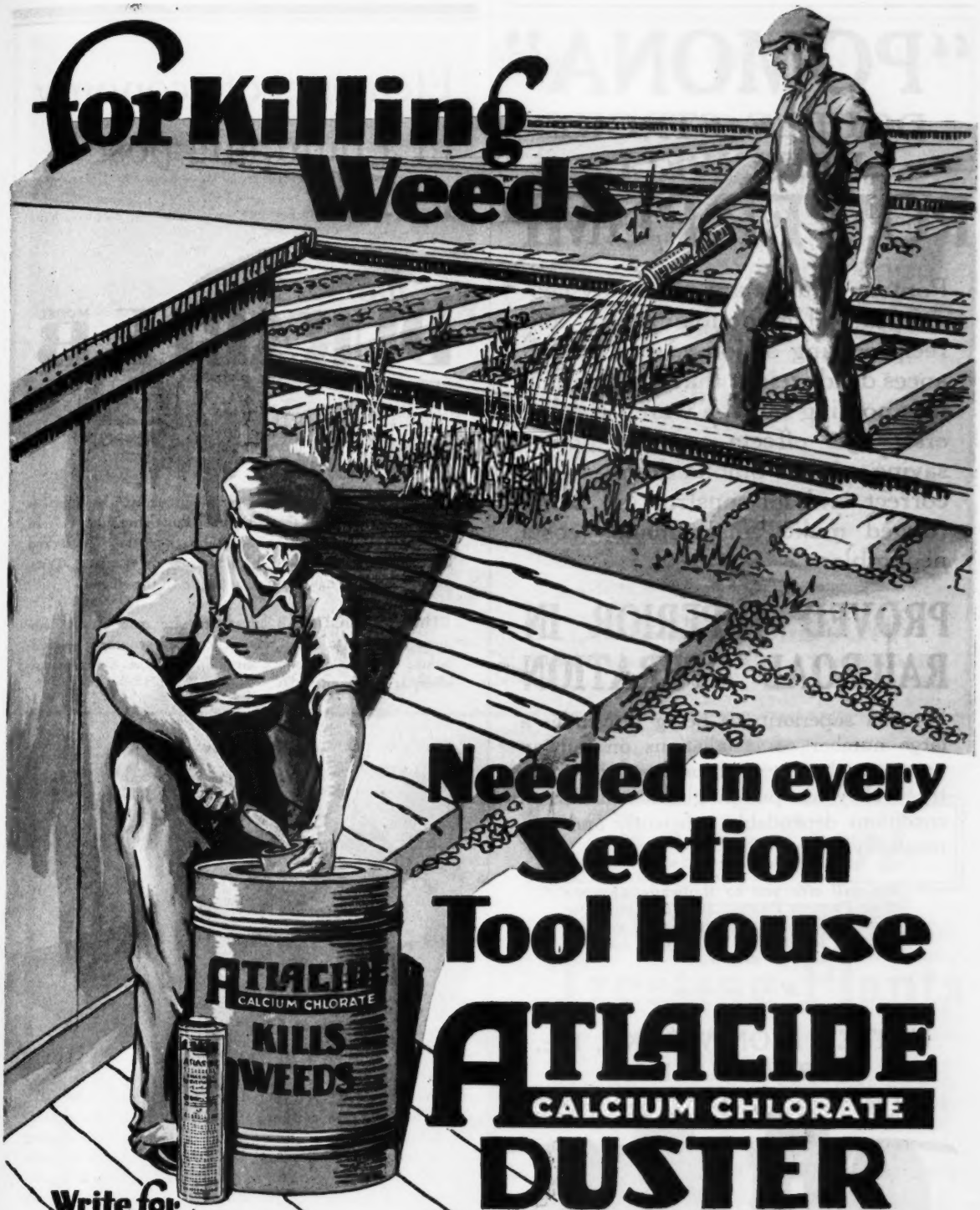

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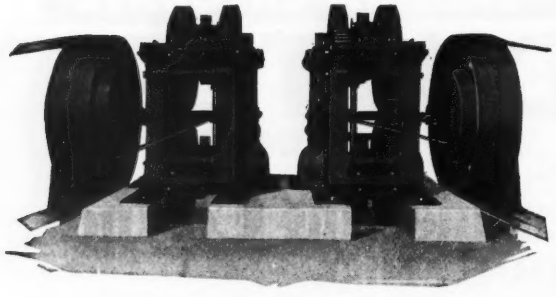

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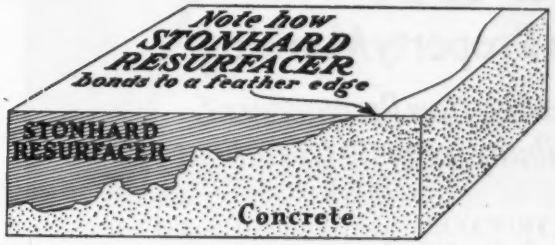

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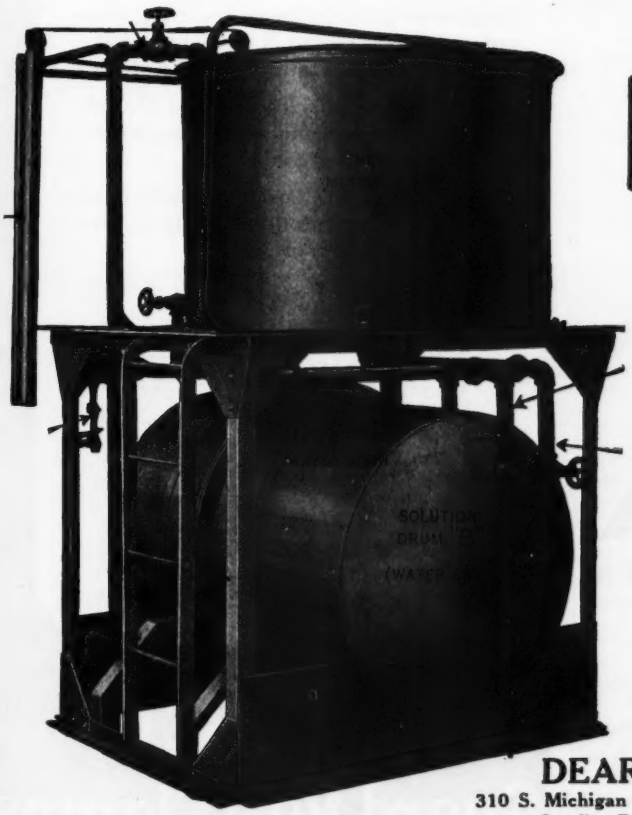

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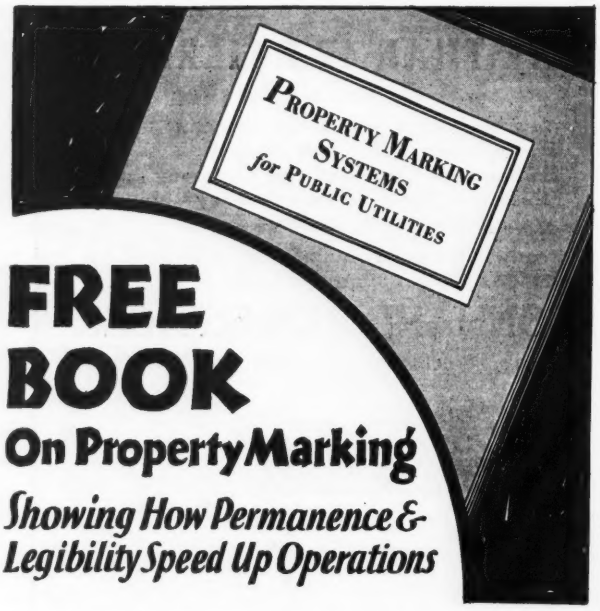

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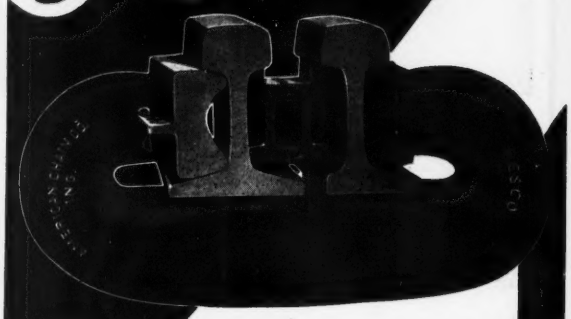

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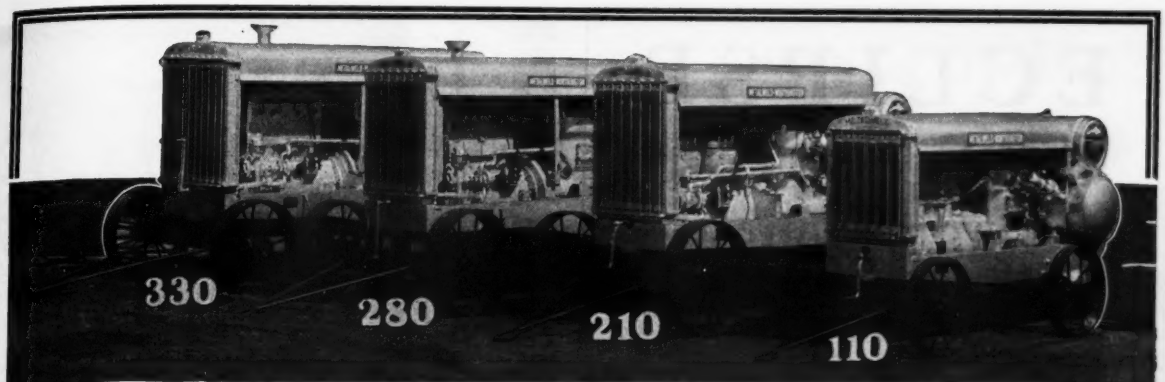

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Curves like this one made Mexican Graphite Curve Grease necessary. Sharp flange wheels are not only dangerous wheels—they are costly as every wheel yard proves. Neither rain, sleet or snow impairs the efficiency of this grease; it affords protection long after ordinary grease is gone to both wheels and rails. A trial supply for the asking.

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Smooth Irregular Surfaces — Reduce Friction Wear

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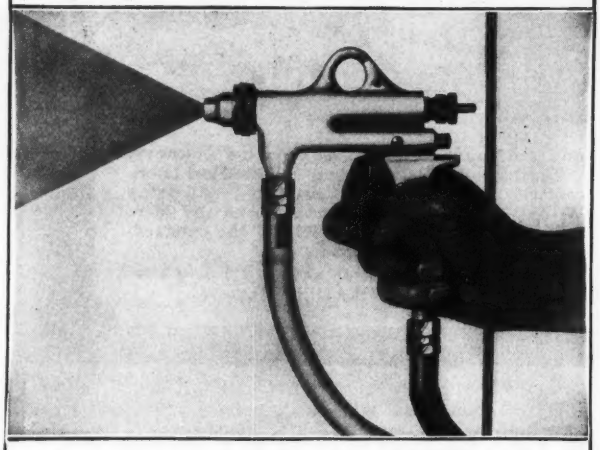

THE place to test the performance of any gun is on the proving ground. For painting operations the proving ground should be your plant for up-keep painting, your products for finishing. Here Eclipse Spray Painting Equipment will quickly and surely demonstrate its superiority over other painting methods.

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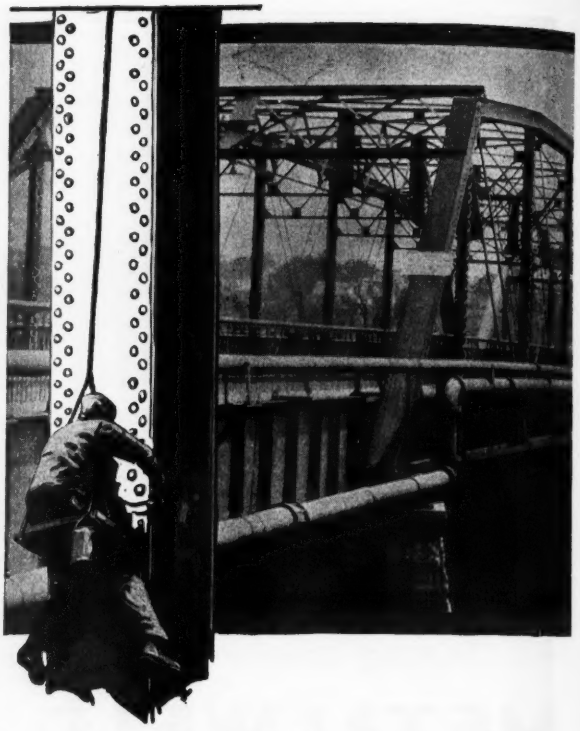

and, after 18 years they painted with Dixon's Silica-Graphite Paint *again*

A most emphatic endorsement of the long wearing qualities of this paint is to be found on Highway Bridge, Haverhill, Mass. Yankee far-sightedness selected Dixon's Silica-Graphite Paint for this job 18 years ago, and in spite of extremes of temperature, moisture, weather and traffic conditions it was not until recently that this bridge was repainted. Even then, a large portion of the original paint job was found to be in perfect condition.

This is paint service! . . . This is Dixon!

But, Highway Bridge is only one of scores of iron and steel structures throughout the industry that have been adequately protected for an unusual number of years from rust, corrosion, and process deterioration by the use of Dixon's Silica-Graphite Paint. This practical example has been duplicated, times without number, in your own industry—very likely right in your own territory.

Write us for a list of bridges where you can inspect Dixon's Silica-Graphite Paint films which have delivered 5 years . . . 10 years . . . and, even 20 years . . . continuous protection.

Get the full story of Dixon's Silica-Graphite Paint by sending for Booklet No. 187B—today.

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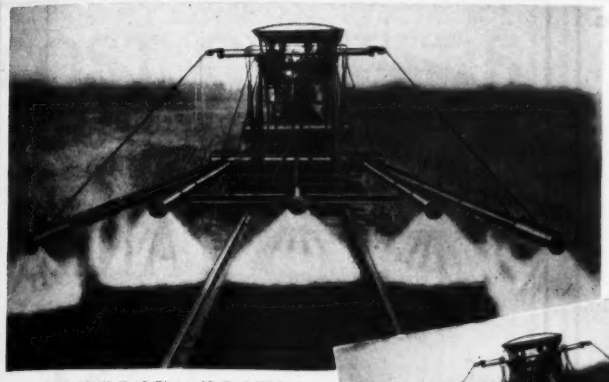
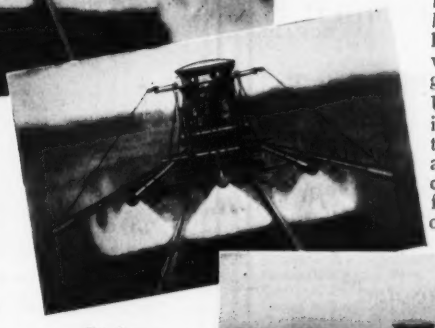


A Solid Wall of Flame 25 Feet Wide

THE "OCTOPUS" has been designed to meet every requirement as it actually exists for the complete and economical destruction of weeds on the right-of-ways of all railroads. Burners may be swung in or out—up or down—at the will of operator while the machine is in operation. Flames may be directed down the side of embankments, up the edges of cuts, or swung around the edges of platforms, crossing fences, buildings, etc. No loss of fuel—no fire where not needed, as each burner is under separate and instantaneous control.



Burning on Ballast—Outside Burners Shut Off

Burning Out Ditches—Side Burners Swung Out to a Width of 35 Feet

The "Octopus"

The New Model Five Burner

Woolery Control-Type Weed Burner

Widest Burning and Most Flexible Weed Burner Yet Produced. Almost human in its action. Wherever the weeds are, the long arms reach out and get 'em.

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Railroads with clean ballast can shut off the middle burners, and by swinging out the long side arms, project the fire into the ditches, or to burn weeds from the ballast toe-line out to a full width of 35 feet, with no fear of trouble from obstructions or uneven ground.

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or Arrange for one on Your Railroad

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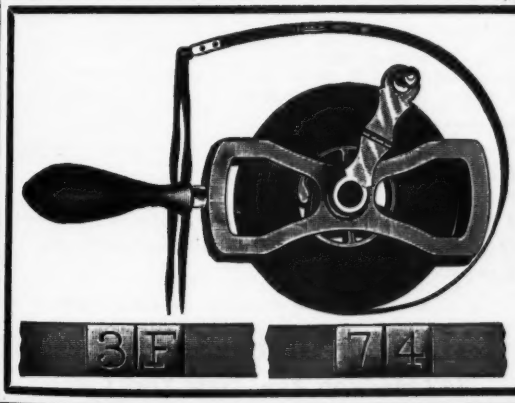

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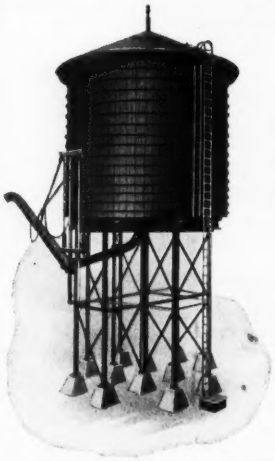

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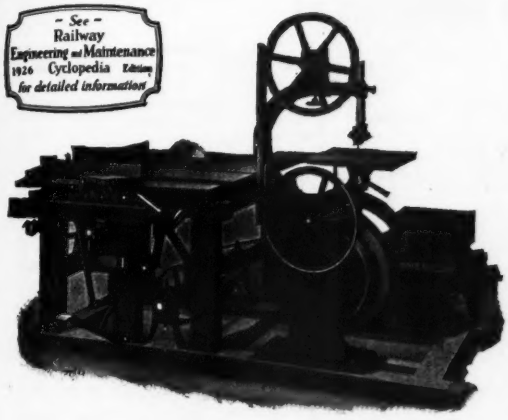

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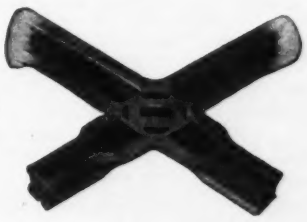

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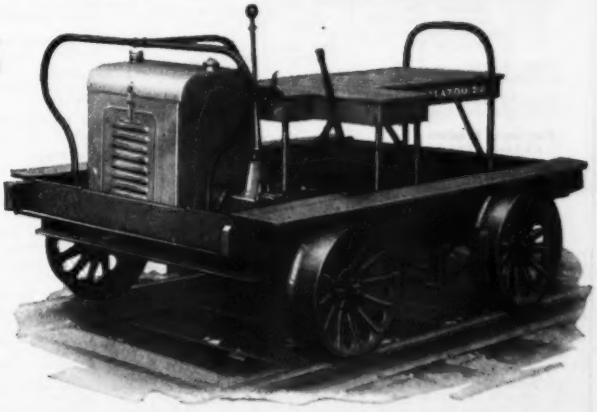

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No. 22

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Established 1883

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Reliance Manufacturing Co.
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Woodings Forge & Tool Co.

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Illinois Steel Co.

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Du Pont de Nemours & Co., Inc., E. I.
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Pipe, Sewer
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Verona Tool Works

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Rails, Tee
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Timken Roller Bearing Co.

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Ramapo Ajax Corp.
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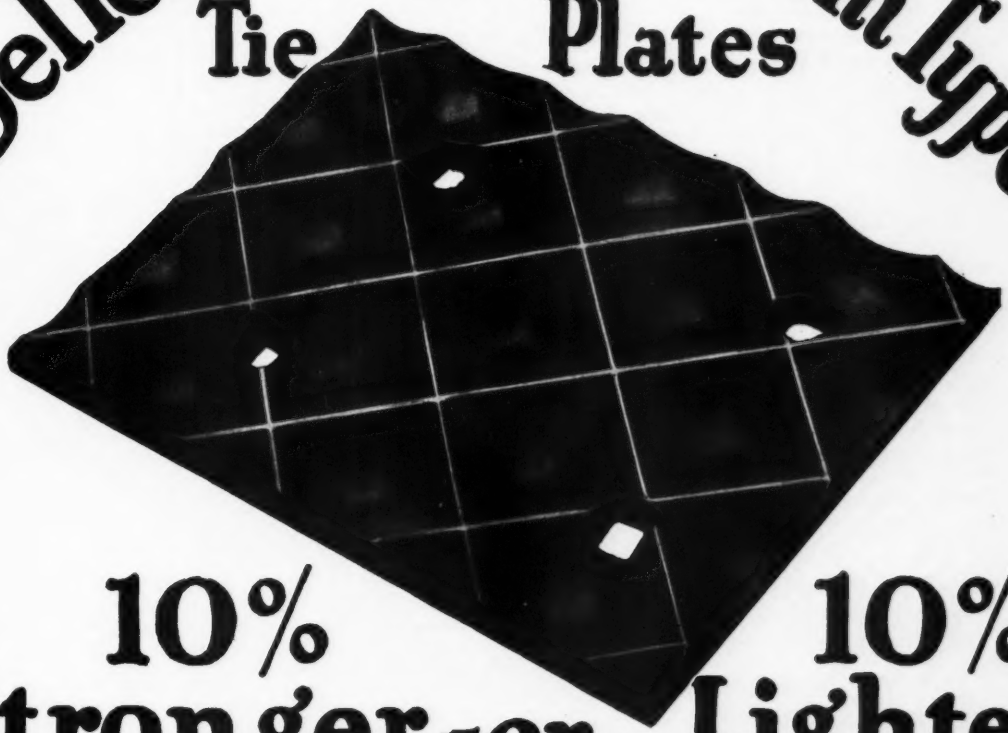

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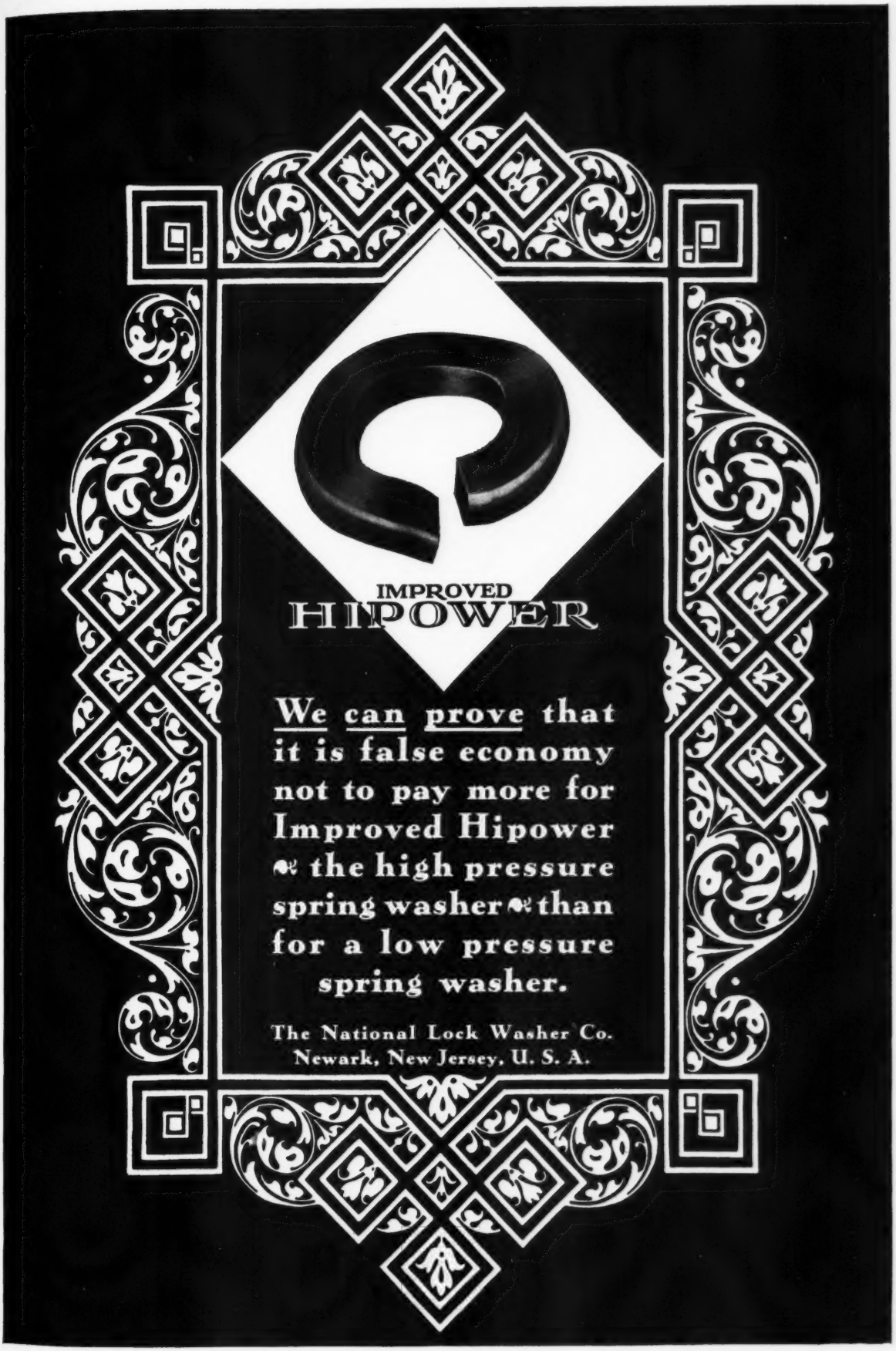
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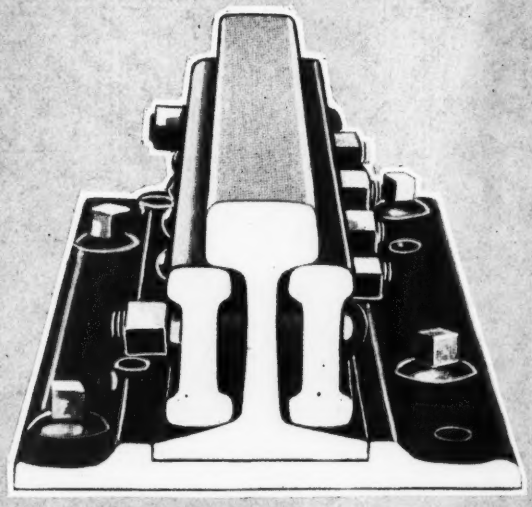

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